

WILFORD'S MICROCOSM:

A RELIGIO-SCIENTIFIC MONTHLY
MAGAZINE,

*Devoted to the Discoveries, Theories, and Investigations of Modern Science
in their bearing upon the Religious Thought of the Age,
With other matters of general interest.*

A. WILFORD HALL, Ph. D., *Editor.*

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PREFACE.

Very little needs to be said by way of explanation in offering *The Microcosm* to the public in book form. Ordinarily such publication of a monthly magazine would scarcely be expected to pay for the necessary expenditure and risk, but the peculiar nature of the scientific and philosophical discussions constantly progressing in these pages furnishes, as we believe, reasonable ground for an exception.

The novel and revolutionary character of the Substantial Philosophy which forms the chief distinguishing feature of the Editor's literary and scientific labors, has become to tens of thousands of his readers a guarantee of such permanency to his writings as to fully warrant printing the different volumes of *The Microcosm* in the best possible shape for preservation. Its pages abound in articles both editorial and contributed, which will doubtless live while books are read ; and we think that those who have purchased the Editor's first book on this general subject—*The Problem of Human Life*—will hardly be satisfied without the different volumes of *The Microcosm* placed alongside as companion-pieces of that widely-read work. For this reason we have ventured to offer them in presentable book form to the reading public, and trust that we shall not be disappointed in the result.

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THE IMMORTALITY OF THE SOUL.

CAN IT BE PROVED BY SCIENCE?

PAPER I.

THE first step in attempting to establish, by science alone, the immortality of the soul, and consequently a future conscious state of existence, is to prove, beyond the possibility of doubt, that the soul is a *substantial entity*. If the soul can be demonstrated to be a *substance*, and not a vaguely-defined "mode of molecular motion" as claimed by materialists, then the most radical believer in the doctrine that "death ends all" must be so shaken in his faith as to admit in advance the soul's *possible* immortality. Nay, more. Prove the soul to be substantial, beyond the shadow of doubt, and the candid materialist will be logically driven to admit its immortality as a *reasonable probability*, since it is a universal axiom of science that no substance, however intangible to our senses, can be annihilated. Hence the very first step in religious philosophy, in order to prove outside of the Bible that man shall live after the body dies, is to demonstrate the soul's *substantial existence here*. Can this be done? Can this intangible essence of our being be analyzed in the laboratory of reason, and, by bringing to bear upon it facts of science and proofs from Nature, be shown to possess an entitative character as really and truly as does the corporeal organism which it inhabits? We believe this can be done; and we will now, as briefly as possible, present the reader with what we regard as demonstrative evidence in favor of this central proposition.

The radical position first assumed and made public in *The Problem of Human Life*, that all the intangible forces, or so-called "modes of motion" in Nature, are real substances,—including light, heat, sound, magnetism, gravitation, electricity, &c.—we still regard as the entering wedge to the scientific proof of a future life, and as the archimedean lever of truth by which the world of atheistic materialism is to

be overturned. The fact that this fundamental view of Nature's forces had hitherto escaped the attention of theologians and Christian scientists, accounts in a large measure for the unsatisfactory results of pulpit efforts and theological treatises in making sensible inroads into the spirit of skepticism, latent and blatant, which has always stood as a bulwark in the way of the spread of Christianity. Instead of massing Scriptural proofs in favor of the immortality of the soul, which none question and few heed, let every clergyman in the land from this time forward boldly take the view of Nature here outlined, and maintain with incontrovertible proofs that the invisible and intangible "forces" are as really substantial as are the corporeal bodies recognized by our senses, and, you may depend upon it, there will at once be opened to view a new world of substantial entities from which a flood of light will be poured into the skeptical mind. Demonstrate from the pulpit that these vaguely-defined nonentities of light, heat, sound, magnetism, electricity, and gravitation are real substances,—things which have an entitative existence as literally and truly as have the food we eat, the water we drink, or the air we breathe,—and we can be certain that it will put the honest scientific skeptic to thinking as he never thought before. He will reason with himself when he listens to such proofs: "If these hitherto meaningless 'modes of motion' are in fact substantial entities, then why may not my soul, my intellect, my wondrous spirit, by which I recognize that *I am*, and by which I voluntarily move my body, direct my course in life, by which I make discoveries and construct ingenious inventions,—why may not this mysterious, indefinable something within me, which materialism tells me is but a 'mode of molecular motion,' be also a substantial entity that must exist for weal or woe in a future life?" Such would be the undoubted drift of his thoughts under revolutionary reasoning like this. The question then is, and it is the ques-

tion of questions in this age of profound research as relates to this discussion, are there such proofs as those to which we have here alluded,—clear, pointed, unmistakable proofs,—which can be poured from the pulpit and religious press into the millions of skeptical minds now in this land, demonstrating that every force of Nature must be, in the fitness and relation of things, a substantial entity? Let us see.

First of all, let us be explicit in the employment of terms. Without correct definitions of words the truth can never be arrived at. For example, *force* is not *motion*, neither is motion force, nor can they by the power of human ingenuity be successfully confounded. Many educated writers, apparently intelligent and discriminating, make no distinction in these two terms, using them interchangeably. This single error constitutes the foundation of materialism, as will be seen fully illustrated in our discussion with Dr. Hazard, as the correspondence is published from month to month in this paper. This indiscriminate use of *force* and *motion* is proved to be the basis of materialistic philosophy by the declaration of Professor Haeckel, the head of that school in Germany, that the soul, or life-force which moves our bodies, is nothing but the complicated *motion* of the material molecules of the brain and other portions of a living organism. (*History of Creation*, vol. i., p. 199.) He thus makes the *motion* of the physical molecules the very *life-force* which produces the motion, thereby confounding the cause with the effect and the effect with the cause! Weaker or more self-contradictory reasoning in a great writer can scarcely be imagined, and can no where be found. Yet this childish jumbling together of *motion* and the *force* which produces it constitutes the foundation of that materialistic system of philosophy which forms the chief argument of modern science against the immortality of the soul. Let this confusion be cleared up, and let the terms *force* and *motion* be shown to sustain toward each other the relation of *cause* and *effect*, and the corner-stone of materialism will have been swept away.

To accomplish this important result, and make it clear to the mind of every reader, the statement of a simple philosophical law and its proper amplification will suffice. The law is this: *The agent or force which moves a physical or inert body must of necessity be a substance of some kind, or the body could not and would not move.* We will now illustrate this law. The water-wheel, for example, is caused to move by the contact of the water with its buckets. Hence the *force* which

produces this *motion* is the substantial *water*. The *motion* of the wheel surely is not identical with the *water* which causes the motion, though this is precisely what materialism teaches in regard to life as the force which moves our physical molecules. Neither is the *motion* of the water the *force* which moves the wheel, but it is the actual *contact* of the water itself with the buckets of the wheel. *Motion*, remember, is not substantial, and hence can not produce motion in any substance. *Motion* is but the *act* of a body in changing its position from a state of rest, and *necessarily ceases to exist* the moment the body ceases to move. All the *motions* of substantial bodies in the universe could never produce the effect of motion in any other body except by substantial contact with it. Motion alone effects nothing in mechanics. Hence motion, in every conceivable case, is but the insubstantial *effect* of the positive contact of a substantial *cause* with some substantial body. In this way the doctrine of the conservation of force may be true, and can be understood, alone on the principle that all force is substantial, and must in the nature of things be conserved in the economy of God's universe, since no substance, however it may change its form, can cease to exist.

It does not weaken our position in the least to object, here, that the water is not the force which moves the wheel, since gravity is the force which gives motion to the water and makes it effective. This very objection illustrates the beauty of our universal law of *Substantialism* or of incorporeal entities, as just presented. The *water* could no more fall without the substantial contact of *gravity* to pull it down than could the *wheel* turn without the substantial contact of the *water*. Thus are forces linked together in the harmonious order of Nature, the motion of one substantial body being but the effect of the substantial contact of another which we call *force*. As the water could not act on the wheel, whatever might have been its motion, except by substantial contact, and as gravity could not act on the water to cause it to fall, except by substantial contact with its molecules, so the ultimate cause, which gave to gravity its power to seize the water and pull it down upon the wheel, is solvable alone by postulating a substantial God as the primordial originator of this force, and the absolute dispenser of the laws of Nature by which her forces are controlled. The Harmony of Nature and the fitness of things require an unbroken concatenation of all entities that exist or move, making them dependent upon each other even back to a primordial intelligent and self-existent causation, and without which the

intellect of man is hopelessly swamped in attempting to solve the existence of one atom, or to account for the occurrence of a single phenomenon in the universe.

Our constant familiarity with such a substance as gross *water*, for example, in its contact with the gross *water-wheel*, by which the latter is caused to revolve, prevents our readily conceiving of *water* as the actual *force* which produces this motion. Materialistic scholasticism, so dominant in our text-books as the basis of all instruction in physics, has confused our minds upon this subject till we understand nothing as "force" unless it be something that is not tangible, and consequently *something*, according to received science that is not *something*, in any substantial sense of the term. Whereas true science must teach us that "force" may be as solid as iron or as intangible as gravitation, while the latter is none the less substantial because of its inconceivable attenuation and intangibility. To prove this, let us take the materialistic student one step farther in the upward gradation of force, from the gross *water* that moves the wheel toward the ideally scientific "force" of gravity that moves the *water*. Science does not hesitate to speak of *steam*, for example, as an actual "force" whenever it happens to forget itself, though it would not think of applying that term to so gross a substance as *water*, especially when discussing the mooted doctrine of the "conservation of force." Science would hardly discuss the "conservation" of *water*, since it distinctly teaches its absolute indestructibility. Yet *steam*, an acknowledged force, is nothing but *water* in a rarefied form, and is as really substantial, though invisible, as is the gross and ponderable *water* itself. If *water* in the form of *steam* is "force" when it drives the piston, so is *water* in its gross form when it turns the wheel! Professor Haeckel, while admitting *steam* to be a *force* would not think of confounding the *motion* of the piston with the *force* that drives it! Nor would he teach such a philosophical jumble of ideas and confusion of terms as that this *force* (*steam*) which causes the piston to move is but the insubstantial "mode of motion" thus produced, and that it ceases to exist as soon as the piston comes to rest! Yet he does teach that very thing in regard to the soul or life-force which moves our corporeal bodies; for he distinctly tells us, in many places in his books, that this *force* is but the *motion* which it produces, and that the *force* ceases to exist with the cessation of the *motion*, namely, at death! It is some satisfaction to know that even this distinguished materialistic philosopher has sufficient lucidity at times to form a correct conception of the nature of "force," especially

when it is dense enough and hot enough to scald him! But reason with him about the force of *gravity*, which accomplishes physical results analogous to those of *steam*, and because he can not feel it with his hand, subject it to chemical tests, see it through his microscope, or recognize it in any other gross or sensuous way, "Oh, it is a *mode of motion*!" How convenient is this universal solution of philosophical problems which do not happen to adapt themselves to the physical senses of advanced scientific thinkers, even to the wiping out of the substantial existence of their own souls and that of the God who made them!

Hence the necessity, in the progress of scientific investigation, for a systematic, and, if possible, successful assault upon one of the most plausible of all the so-called "modes of motion" in Nature, the *wave-theory of sound*. Christian philosophers and scientists have been slow to appreciate the value of this assault, or even to comprehend its appropriateness in the solution of the problem of human life. But, thank God, its importance is beginning to be seen and felt by the religious world, and we believe it will grow till it will be regarded as the very corner-stone of the argument which assumes to prove from science the possibility of a future life, in opposition to the claims of scientific materialism. For example, and as an illustration of its bearing, could Professor Haeckel be made to believe that the *wave-theory of sound* was a scientific fallacy, and, as the only alternative, that sound must be a veritable substance, he would at once, as a logical and philosophical reasoner, be forced to renounce his materialistic view of the soul as but a mode of molecular motion, and would admit, as the only alternative, its substantial nature. Further, let him be convinced that the soul is a substantial *entity*, instead of an insubstantial *motion* of our corporeal atoms, and he would be compelled to renounce atheism, since it is just as easy to believe in a substantial but immaterial God, who can think, feel, love, &c., as to believe in a substantial but incorporeal soul that can do the same things! Then, with this change of base, would vanish his hypothesis of, or necessity for, spontaneous generation, since the soul, as a substantial entity, being capable of moving our bodies, and directing them to the creation of magnificent inventions and works of art, proves that a substantial God would be capable of creating the first living organism, and if the first, then Haeckel is too much of a logician to suppose with Darwin that God personally and miraculously created the first animal, breathed into it a substantial soul and mental power, and then abandoned His work, leaving Nature to develop as

it might, or not develop at all, as it happened. Hence, as the reader must see, the necessity of breaking down this prevailing materialistic fallacy, that everything in Nature is a "mode of motion" which can not be brought within the analysis of our senses, or demonstrated to be substantial by chemical tests. Hence, therefore, the necessity of our exhaustive assault upon the wave-theory of sound.

Religious scientists who are so ready (without due reflection, we must insist,) to object to our attack on the wave-theory of sound as a foolish argument in favor of the substantial nature of the soul, never stop to think that if sound be really a mode of motion and not a substance, so must be all the other forces of Nature, including the life-force which moves our bodies. They little think that, by this short-sighted objection to our position on sound, they are actually playing into the hands of Haeckel and Huxley by helping them to prove the soul but a mode of molecular motion, thus keeping it in harmony with sound, light, heat, gravitation, and other natural forces and phenomena! Prove Tyndall to be right on sound, and you have more than half given up the scientific ship to Haeckel, by admitting that the soul is not a substance but merely some kind of a process of molecular vibration! We beg, therefore, of Christian ministers and religious philosophers to reflect seriously before unceremoniously scouting our position on sound, especially as is too apt to be the case, without giving it very critical examination.

We assume, then, that demonstrative evidence of the substantial nature of the soul, by a series of incontrovertible proofs that Nature's forces are all substantial entities instead of modes of motion, is the entering wedge to the overthrow of scientific materialism and infidelity, and we insist that the time has come when these proofs should be driven home from the pulpit and the press by the mallet of logic, aided by the irresistible analogies of Nature, till every candid listener and reader shall feel and acknowledge their power. Let the preacher who desires to convert his skeptical hearers take up the study of science, not solely from the text-books, but also from Nature and common sense, and then, when he preaches against infidelity, let him take for his text the "electro-magnet," for example, instead of some isolated segment of a Scripture verse, which infidels scout, and let him press home the marvelous fact that an actual *substance*, which science calls magnetic "force," and which none of our senses can recognize and no chemical test can determine, is passing from the magnetic poles, pouring through the most impervious bodies, and seizing a bar of inert steel, which it absolutely displaces

and draws toward itself as if pulling it by tangible cords. Let him even take with him into the pulpit a common horse shoe magnet—one that he can buy for fifty cents—and a pane of ordinary window glass, and let him suspend a small bar of iron by a thread, in the presence of his congregation, holding the sheet of glass between the magnet and the bar so that his auditors may witness the action of the invisible magnetic streams as they pass through this impervious body and seize the bar as if nothing intervened, and he will present to every intelligent person present the most magnificent and unanswerable scientific argument in favor of the existence of God and the immortality of the soul ever exhibited to man.

No matter if some of his congregation should object that this was not a sermon but a scientific lecture. So much the better. Let us have a change. We need more true science mixed up with our sermons for the popular mind, and we need more texts quoted from God's book of Nature, if we would induce skeptical scientists and thoughtful men of the world to attend the church. As proof of this, look at the fact that in this very city, while our ablest divines are preaching their usual free sermons to a pitiful hundred listeners, Ingersoll is delivering his atheistic lectures to crowded audiences at a dollar a head, while hundreds go away for want even of standing room. These are startling facts sufficient to appall the Christian world, and make every believer in religion tremble for the future of the Church. In what way can such a state of things be counteracted? We solemnly believe that the only cure for it is for every clergyman in the land to reconstruct himself into a Christian scientist and mix freely in his sermons scientific illustrations with the glorious gospel of the Son of God, and thus combine freely God's testimony in Nature with the written word, even if he has to take with him into his pulpit every Sabbath evening a miniature steam-engine, a magic-lantern, and a complete electro-magnetic apparatus!

Let the minister who would convert his infidel friends take a new departure, and demonstrate from science that entities exist all around us completely beyond the range of our corporeal senses, and consequently, judging from all the analogies in Nature, that the soul must also be an entity. Let him, as we have been trying to do here, insist upon the fact that, as the water-wheel could not turn without the *substantial* contact of the water, and as the piston could not move without the substantial contact of the steam (an acknowledged force), so the suspended iron bar could not, by any possibility, be drawn toward the magnet without the substantial contact of an actual entity connecting

them together, notwithstanding this substance was so far above material conditions as to pass uninterruptedly through a sheet of glass as if nothing were in the way. Let him then defy the intellect of man to conceive of any essential difference between the three forces referred to, as to their substantial nature, except in degree of density and intangibility.

Finally, let him make intelligent application of these facts of science and analogies of Nature to that intangible force which moves the molecules and organs of our bodies, and according to every principle of logic and reason it will demonstrate the soul to be as truly a substance as is the water which moves the wheel, the steam which moves the piston, or the magnetic currents which move the iron bar, since they all accomplish similar corporeal results. In this manner can the soul of man be proved by science alone to be a substantial entity; and if substantial, then its indestructibility necessarily follows; and if indestructible, then its personal immortality can reasonably be established, since a substance involving thought, feeling, sensation, and self-consciousness cannot, as such, cease to exist.

The objection, now in the reader's mind, that this view involves the immortality of the lower animals as well as that of man, will receive due consideration in our next paper.

WILFORD.

RELIGIOUS DENOMINATIONS.

Under this head we purpose to give sketches, from time to time, in *The Microcosm*, of the different denominations of Christians in this country, giving precedence to those not so generally known in our large cities. We think such information desirable in a paper which can never have a sectarian leaning, which will be read by all denominations alike, and which will have a general circulation in schools and colleges and among the masses of non-church reading people. We inaugurate this department by a sketch of

THE UNITED BRETHREN IN CHRIST.

The above-named branch of the Christian church was founded in Pennsylvania and Maryland, by the Rev. William Otterbein. Mr. Otterbein was a native of Germany, was highly educated, and ordained to the ministry in the German Reformed Church. About the year 1750 he came to America as a missionary, he being then a young man. He labored for a number of years in Pennsylvania as a minister in the German Reformed Church; and was very earnest and spiritual in his discourses, insisting on the importance of the new birth and consciousness of sins forgiven. Being thoroughly imbued

with missionary zeal, and his radical views respecting conversion and regeneration being not well received by the ministry and members of the denomination under whose authority he was laboring, he went forth on his own responsibility preaching at different points and urging sinners to repent and seek full redemption through faith in Christ Jesus.

In the fall of 1774 he attended a meeting held on Sunday in Isaac Long's barn, in Lancaster County, Penn. Rev. Martin Boehm, a spiritually-minded minister of the Mennonite Church, preached with great power. As he concluded his discourse, Mr. Otterbein, very much affected and quite overcome with emotion, rose to his feet, and, in the presence of a large and very solemnly impressed audience, clasped Mr. Boehm in his arms, exclaiming at the top of his voice, "We are brethren!" The effect on the audience was electrical: and from that day these two ministers labored conjointly, and began to organize societies under the name of UNITED BRETHREN IN CHRIST.

Soon after this Mr. Otterbein established himself as pastor of a congregation in the city of Baltimore, which became the nucleus of the new denomination. Mr. Otterbein not only discharged the duties of pastor to his congregation in Baltimore, but traveled and preached at other points; and organized societies and ordained others to preach, and sent them forth to declare the gospel to the people.

In 1789 these laborers were called together in a conference in Baltimore, and Mr. Otterbein was elected Bishop. Since then the denomination has increased, and spread into all the Middle and Western States and Territories, and into several of the Southern States; and at present numbers five bishops, 46 conferences, 2,196 ordained ministers, 4,524 organized churches, 157,835 communicants, 3,043 Sabbath-schools, 26,819 Sunday-school teachers, and 159,141 Sunday-school scholars.

In faith and mode of worship it is almost identical with the Methodist, except that in all cases it permits adult applicants for baptism to choose the mode, and leaves each society free to practise or not feet-washing as a church ordinance; but it in no way sprung from the Methodist church, as some have supposed. It never would permit its members to hold slaves, nor to engage in the manufacture or sale of intoxicating liquors.

In church government it is republican. The legislative authority of the church is vested in a quadrennial general conference, which is composed of delegates elected by a direct vote of the entire membership, each annual conference being entitled to three delegates. The bishops and all the other officers of the church at large

—such as editors, publishing-agents, &c.—are elected by the general conference, to serve for four years. The ministry is on the itinerant plan; but a minister can remain with the same congregation for an indefinite number of years, by special request of the congregation, ratified by the annual conference. The presiding elders are elected annually by the ministerial members of the annual conference. The laity of each charge are represented in the annual conferences by a lay member chosen by the quarterly conference of the charge. The class-leaders and class-stewards are elected annually by the members of the class.

The denomination owns a large publishing-house at Dayton, Ohio, at which it publishes two (one German and one English) weekly papers, four monthlies, and numerous books, tracts, &c. The property is valued at \$150,000, and is free of debt. It has also a Home, Frontier and Foreign Missionary Society, a General Sunday-School Society, a Church Erection Society, a Women's Missionary Society, and a General Board of Education.

The denomination has under its supervision the following institutions of learning: Union Biblical Seminary (a theological school), Dayton, Ohio; Lebanon Valley College, Annville, Pennsylvania; Otterbein University, Westerville, Ohio; Hartsville University, Hartsville, Indiana; Westfield College, Westfield, Illinois; Lane University, Leocompton, Kansas; Western College, Toledo, Iowa; Philomath College, Philomath, Oregon; Green Hill Seminary, Green Hill, Indiana; Avalon Academy, Avalon, Missouri; Elroy Seminary, Elroy, Wisconsin; Edwards Academy, Greenville, Tennessee; Fostoria Academy, Fostoria, Ohio; Washington Seminary, Huntsville, Washington Territory; Roanoke Academy, Roanoke, Indiana. There are several other institutions owned in part by the Church, or under the patronage of the Church.

The last General Conference met in Lisbon, Iowa, on the 12th day of May, 1881.

SCIENTIFIC FOLLIES.

BY REV. W. K. BOYLE.

It is said that laughter and tears are so closely related that the transition from the one to the other may be almost instantaneous. This is not more true than that Wisdom and Folly often go hand in hand. The law of compensation claims its subjects among the wise. Any remarkable mental development is apt to be closely associated with some equally remarkable defect. A scholar is often a fool in regard to practical things; but is so confident that he knows, that his folly becomes only more marked to people of ordinary sense.

Scientists, for instance, maintain that Faith may do in the domain of religion, where facts are not always to be had; but in science there can be no truth received unless it has its foundations on fact; and therefore they entirely reject any statement unless carefully deduced from established and well-proven data. With them the scientific method of reaching truth is solely by induction. And yet it is notorious that there is more credulity among scientists than our holy religion demands for the acceptance of its truths; for a reasonable probability is claimed for every statement of God's revealed Word, but scientists often violate all probability by their statements. Witness Tyndall discerning in matter "the promise and potency of all life," when non-living matter has never shown life, except through the intervention of known living causes. The gap between the non-living and the living is a chasm which can only be bridged by creative power. And Sir William Thompson's "spores," wafted to this earth from some other planet, through which life began here, demands a credulity which the sane can scarcely furnish. The astronomer and philosopher in Rasselas, who, though very wise, had "a bee in his bonnet," is a type of many a learned man at the present day. And the philosopher in the "Pickwick Papers" with whom Mr. Pickwick collided in the lane, and who wrote to a neighboring society a highly scientific account of the phenomena accompanying a moving light (that is, Mr. Pickwick's lantern), which other learned societies received and discussed, is so true to life that it would not be very difficult to give names and dates to match. And really it seems as if certain scientists of world-wide fame will soon become the laughing-stocks of the age, unless they have manliness enough to admit themselves in error, before the laughing becomes universal.

Let us examine a late scientific statement, and see if we cannot discover another proof of exceeding credulity. A learned professor writes, "If there is anything certain in mechanics, it is that a cricket does kick the earth away from him when he jumps." That is, the cricket remains still, and the earth is pushed away, and his progress is really the earth's retreat. Another says, "the cricket kicks the earth away in the opposite direction, to a distance exactly in proportion to the weight of the two bodies." This is a little better: it is science. Is it sense? What powerful legs these scientific crickets have! And our poor old mother earth is being wonderfully kicked about all during cricket-time; and as they jump in every direction, I would like to know the line of the least resistance. And as crickets are restless, the earth can never be still; and this accounts in

part for the scientific dogma that matter is never quiescent. Given two crickets of equal size, and ready to jump at the same time, and toward each other,—according to such science as the above they could not move, strive they never so mightily, as until the earth moved they could not throw themselves forward at all. Admit the fact as stated by scientist No. 2, and the motion of the earth would be practically immeasurable, as the proportion between the two bodies would be so incalculable as to amount to nothing; and besides, as gravity demands the attraction of all bodies toward each other with a force in exact proportion to the matter they contain,—so the cricket, from the moment of its flight, would attract the earth to it by a force which would lessen the earth's displacement at the time of the original jump, and this force would be almost if not exactly in the same plane, and so would neutralize the original expenditure of force. Now, is not all this cricket-kicking science the sheerest nonsense? And does not this remind us of the problem of the schoolmen as to the determining motive in the mind of the ass placed equidistant between two shocks of fodder exactly alike, and which, ass-like, did not eat either, because it could not establish a preference and so gain a motive, and therefore starved for consistency's sake? And yet men gulp down such stuff, and call it science; and scientists expect us to accept such bosh for truth. And they enjoy the amazement of the unlearned at such statements as a juggler does the surprise of the gaping crowd before him. A child may believe a lie told by an adult; but once undeceived, and no further statement, unless fully sustained by proof, can tempt the child's faith. And this is rapidly becoming the attitude of the laity as to scientific announcements. The scientists want us to swallow the philosophy of Evolution, and they are not themselves agreed about it; and the facts supporting the theory of natural selection and survival of the fittest are really as wanting as is "the missing link."

Oh, do give us science which wars not with sense! Wisdom and Folly are twin sisters; and science and nonsense go often hand in hand.

DOUBT.

BY COL. J. M. PATTON.

THE periodicity of human thought has brought an age of unrest, in which foundations are being upturned; accepted axioms are being defined afresh; settled truths are being challenged; and new theories are being divulged in tropical luxuriance, and as locusts for multitude. It is not to be regretted. It is the old

story: re-action from rest,—a great world-awakening from slumber and from dreams. It is proof even as to those who have been energetically building *dirt-heaps* of the "divinity that stirs within." It is proof even as to those who deny it, or are unconscious of it, of that "longing after an immortality," which is coveted by all, and *wholly* despaired of by none, or by very few. Old doubts are to be removed, and new ones suggested. Giants are yet to be fought, and slain.

No honest doubt, however, is to be reproved. The peril is in the manner in which it is injected or received, and in the after treatment of it. That great thinker, Frederick W. Robertson, says somewhere that doubt is the parent of truth; and that he who has never doubted has never had a robust and intelligent faith in *any* truth. This is a world of doubt. Truth lies hidden, like the diamond, deep in caves and abysses of the earth,—blooms, like the edelweiss, on Alpine summits; and must be *searched* for, not alone with toil, but with *singleness of mind*,—with direct, honest, practical, and painful effort. No sluggard's eye—no divided mind—will ever bring her within the range of vision. She is also many-sided. No single direct gaze will ever encompass her lovely proportions; for she is the "fair consummate flower" of many diverging and concurring "lines of beauty." She often lies, even, hidden snugly between two *apparently* conflicting things. A careful and honest search may sometimes find her as a resultant of the two,—though sometimes, like God, her author, she hides herself almost impenetrably; but yet we have a motive to search for her, for *we know she is there*. But, if we would succeed let our search be exhaustive. No *exclusively* earth-bound gaze of the scientist will find her,—no wholly firmament search of the hermit or the ascetic will disclose her; but effort must radiate *everywhere*,—in matter, mind, and spirit,—for, lo! she fills *all* things, and the *universe* is her dwelling-place.

What a field for doubt! And yet, we should not fear for an *honest* doubt, resulting from ignorance, lack of opportunity for study, or unwise authority, rather than from a perverse temper. If fairly dealt with—if purged and chastened by clean hands and a pure heart—that honest doubt will only prove an "angel unawares," who will conduct us into the ineffable light. But when we put our doubts to the test of the crucible, let us be sure, *at our peril*, that our hands *are* clean, that our hearts *are* pure, and that our doubts *are not* perverse. Let us be sure that there remain from the purifying fires no ashes of impure desires or disloyal purposes placed there by us, if we would see arise the radiant vision of our holy mistress

—doubt-dispelling Truth,—instead of the horrible figure of Despair.

It would be injustice, no less than folly, to charge all those who have even *grossly* erred, with conscious dishonesty of investigation, or unholy dealing with their doubts; for human motives are too complex for analysis by any mind less than divine. But surely we may be pardoned if we conjecture that when one has doubted till he has buried all religious systems beneath the blackness of darkness and nothingness (thus giving a warning and example to us all), there must have been on his part some fatal misdealing with his doubts. Even Herbert Spencer will sympathize with us in this opinion, and share, perchance, our pity for the victims of a neglected or lightly-treated doubt; for he says, “a religious system is a normal and essential factor in every evolving society.” (*Sociology*, seventh ed., 1878, p. 313). True, oh master! And doubtless then—unless you consider “a religious system” practicable without a God—you will weep with us to hear the wail that rang out from the soul of Prof. Clifford (your brilliant and misled pupil) ere it fled into the “unknowable” night: “It cannot be doubted that theistic belief is a comfort and solace to those who hold it, and the loss of it is a very painful loss. It cannot be doubted, at least, by many of us in this generation, who either receive it now or received it in our childhood, and have parted with it since with such searching trouble as only cradle-faiths can cause. We have seen the spring sun shine out of an empty heaven to light up a soulless world. We have felt, *with utter loneliness*, that the *Great Companion is dead*.” Yes, weep with us, oh master! at this; and withhold not your tears at a like sad strain from another of your unhappy pupils: “Never in the history of man has so terrible a calamity befallen our race as that which all who look now may behold advancing as a deluge, black with destruction, resistless in might. . . . The floodgates of infidelity are open, and atheism overwhelming is upon us. . . . I am not ashamed to confess that with this virtual negation of God, the universe, to me, has lost its soul of loveliness. And when at times I think, as think at times I must, of the appalling contrast between the hallowed glory of that creed which once was mine and the lonely mystery of existence as now I find it, at such times I shall ever feel it impossible to avoid the sharpest pang of which my nature is susceptible.” (*Physicus on Theism*, pp. 51, 114.)

If *The Microcosm* shall fulfill its mission, and relieve despair by enlightening doubt, it will be a rich boon to all honest searchers for the truth.

If it shall save but one such noble victim of unpurged and unchastened doubt as Clifford or “Physicus” from the “utter loneliness” of a Godless universe, then, surely, both angels and men will call its work a blessed one.

LIFE-INSURANCE.

BY PROF. I. L. KEPHART, A. M.

LIFE-INSURANCE is a necessity of our advanced civilization. The progress of the era is indicated by the facilities devised to protect the helpless against suffering and poverty. The fundamental purpose of life-insurance is to furnish the medium through which the man of limited means and moderate income may provide his dependent wife and children with an ample competency in the event of his sudden and untimely death. To the extent that it does this, *sure and certain*, and to the largest number possible, to the same extent is it one of the most humane and philanthropic institutions of modern times. And to the extent that it merely *promises* this, and through such promises secures the money of the confiding policy-holder, and then fails to provide for his widowed wife and orphaned children in their time of need, to the same extent does it deserve the anathemas of mankind.

That in thousands of instances the former has been and is still being done, is a most gratifying truth; and that in by far too many instances the latter has been the result, is a fact greatly to be deplored. As every valuable coin has its counterfeit, so many companies have proven to be only base imitations of genuine life-insurance, organized and managed to enrich a few adventurers who for a time shone as officers, and their names sunk into infamy through the collapse of the bogus institutions they had founded. Says an insurance commissioner: “Within the memory of persons yet young, more than a hundred and twenty life-insurance companies have passed into disgraceful history, taking with them thousands of unkept promises.”

But the fact that life-insurance has been perverted—that it has been made a means by which the unsuspecting have been swindled—is no reason the genuine article should be condemned. In spite of the abuses that have been practised, and the base purposes to which it has been perverted, in this advanced age, it is still a staple article. This will appear when we note the magnitude of the business.

On the first day of January, 1880, there were sixty regular life-insurance companies doing business in the United States, having outstanding policies to the number of 722,432, covering

risks to the amount of \$1,542,909,011, and having assets aggregating to \$449,537,793. In addition to this, the various Mutual Aid, Mutual Benefit, and Mutual Relief Societies, all classed under the general head of Assessment Companies, had not less than 575,000 outstanding certificates of membership, covering risks to the amount of \$876,500,000. These figures indicate the vastness of the life-insurance business of this country. That a business covering such an immense field, and holding in its grasp the expected means of sustenance for thousands of the future widows and orphans of this land, should be guarded and administered with the utmost care, all are ready to admit. And that, in many instances, it has not been so administered, is proven by two facts: first, the fact that within a comparatively short period more than one hundred and twenty regular companies have failed, involving a loss to the policy-holders of many millions of dollars; and, second, the fact that in the last ten years next preceding January 1, 1880, the sixty companies now doing business in the United States have lost by *lapse* and *surrender* alone as much business as they, at that date, had on their books. These facts, certified to by the insurance-commissioner of Kansas, call for reform in the management of life-insurance.

The weakness of the regular plan consists chiefly in two of its features. First, it places vast sums of the policy-holders' money in the hands of a few officers of the companies, without requiring guarantees commensurate with the trusts reposed in them. This, to say the least, tempts to carelessness. The officers of the sixty regular companies have now under their exclusive control \$450,000,000 of the policy-holders' money, an amount greater by \$112,500,000 than the entire circulating notes of all the national banks of this country; and while the banks are required to secure *by deposit*, every dollar of their circulation, the insurance companies are permitted to possess, handle, and control these vast sums without giving their rightful owners (the policy-holders) any security except the personal promises of the officers. This fact, coupled with its legitimate effect, namely, the disgraceful failure of so many companies, entailing a loss of many millions of dollars on the policy-holders, while it has not lessened the desire for valid insurance, has awakened great distrust of the companies. Second, the extravagant expenditure of money in commissions to agents and in the payment of officers' salaries. Sixty-one companies, during the first three years of their existence, paid to their policy-holders in death-losses and other claims only \$5,656,897, and consumed in expense of management \$14,353,451. For com-

panies to pay their presidents salaries of from \$25,000 to \$60,000 per annum, is palpable evidence of gross extravagance, and clearly indicates that they, in some way, exact from their policy-holders more than is just and equitable.

These defects, the influence of which works great detriment to the business, can be removed. If the national banks can and must give security, dollar for dollar, to the full amount of their circulation, why should not life-insurance companies give the same for their reserve fund? And when experience has demonstrated that all well-managed companies receive annually, in premiums alone, much more money than they pay in death-losses, dividends, and matured endowments, why not diminish the premium, and thereby avoid placing in the hands of the officers millions of dollars of the policy-holders' money, to be simply at their mercy? In the last thirty years, the strongest life-insurance company of this country has collected from its policy-holders, in premiums alone, \$196,470,467. During the same time it has paid to them, *for all purposes*, only \$141,080,885; and of this amount \$33,381,239 were paid for *surrendered policies* and *additions*. These figures show that a much less annual income from premiums alone would have been ample to meet all the claims upon the company. And, as insurance is always in demand, as there is no probability of the demand for it ceasing, we are safe in assuming that, for all time to come, honest and careful management will maintain the company in its present condition, and secure to it (even at a much lower rate), from premiums alone, all the funds needed to meet its obligations.

Thus, the statistics of all the companies show that life-insurance may be safely conducted on a plan that does not compel the insured to place in the hands of the officers of the companies vast surplus sums, to be squandered on palatial office buildings that do not pay two per cent. on the investment, and will never realize to them twenty-five per cent of the actual cost, and to be otherwise squandered in extravagant salaries paid to themselves by self-elected officers of the companies. And these considerations are well worthy of the careful thought of those who would benefit the masses by affording to them *actual* insurance at the lowest figures consistent with safety, and who would relieve a laudable business of some of the odium which abuses have heaped upon it.

HISTORY OF COCHINEAL.

COCHINEAL (Spanish *cochinilla*, originally the name of the coccus insect, used in dyeing,) is a substance used in dyeing crimson and scarlet,

and is employed in the preparation of the colors carmine and lake. It consists of the bodies of the females of the *Coccus cacti*, which feed on plants of the cactus family, particularly on the cochineal plants (*Opuntia Cochinillifera*, *Hernandezii*, and *Tuna*), nearly allied to the prickly pear.

The cochineal plant is a native of the warm parts of America, and is cultivated for the sake of the valuable insect which feeds on it. This cultivation was practiced by the Mexicans long before the country was known to Europeans. It is now carried on also in parts of the West Indies and Peru, and in the Canary Islands, where it forms a very important article of commerce with Europe and the United States. The cochineal insect is very small, a pound of cochineal being estimated to contain not less than 70,000 in a dried state. The male is of deep red color, and has white wings. The female is wingless, and of deep brown color, covered with a white powder, flat underneath, convex above. The cultivator procures branches laden with the insects, and keeping the branches till the mother-insects have laid their eggs, he places their bodies, with the eggs, in little nests formed of some cottony substance upon the cochineal plants, and the young insects, when hatched, spread themselves over them.

The gathering of the cochineal is very tedious, and is accomplished by brushing the branches with some soft brush, such as the tail of a squirrel. The insects are killed by boiling water, by heating in ovens, or by exposure to the sun. They must be quickly killed, to prevent them from laying their eggs, which diminishes their value. When killed and dried, they may be kept for almost any length of time without injury. The coloring principle of cochineal is carminic acid ($C_{14}H_{14}O_8$), known in an impure state as *carmine*, and combined with alumina as *carmine lake*.

Cochineal is used for dyeing wool and silk scarlet and crimson. The colors are very brilliant, but not durable. They are easily spotted by water and alkalis. The mordants used are alum, cream of tartar, and tin salt.

SCIENCE AND RELIGION.

A few years ago the attacks made upon religion by some men of science led to the formation of an English society to investigate all philosophical or scientific questions, more especially those said to militate against the truths of revelation, and to publish the results to its members in a quarterly journal. This society, which was called the Victoria Institute, or

Philosophical Society of Great Britain, now boasts of 900 members, each paying a small annual subscription, among whom are many leading men of science. The Archbishop of Canterbury and several English, Colonial, and American prelates have also joined it. Lord Shaftesbury recently said :

"The object with which this society has been formed was not merely to beat down the views of others, not to be antagonistic to the progress of science, but to do all that we could do for the development of truth, and, if I may use the phrase, to give religion 'fair play.' This society was not founded to establish either one opinion or another. It was not started for the purpose of setting up the Bible against science. The object of the society was, that science should have fair play, that the truth should be told on all sides, and that we might get rid of the despotism of certain scientific men. Because it is perfectly well known that men of science, with all their sublime and mighty notions, are as despotic as the weakest of the human race, and they are exercising their despotic sway to a remarkable extent over a very large number of rising young men, who are either fascinated by what they have read and discovered, or are crushed by the authority of a few great names. It was in order, as I have said, that science should have fair play, that this Institute was established, and the blessing of God has so rested upon it that it has at last taken a hold in public estimation."

The foregoing contains most important suggestions for wide-awake and advanced thinkers in the United States. What hinders the immediate organization of such a society in this country? We surely need not taboo an enterprise or organization here because it is copied after its progenitor in the mother country. This model society is a noble one, and we, as a nation, proverbially in favor of advancement in everything which tends to the general enlightenment and improvement of the masses, should lose no time in forming the nucleus of its American counterpart, so well calculated as it is to do good. We are in favor of giving both science and religion a fair show. There is no conflict between true science and true religion, though error, wherever it may be found, is not only in conflict with truth of every kind, but it is inconsistent with itself in all its phases. What we need in this country, and now, is an organization whose aim shall be to sift the true from the false in every department of public research, speculation, or instruction. Let ministers, scientific men, and especially teachers, give us their views upon this subject. We are ready to lend our aid, and the influence of *The Microcosm*, toward the work here indicated. New York is a good point, probably the best, for the initial movement to bring about such an association. We will report in the next number of this paper whatever response shall be made to this suggestion.

ART-LIFE AND OTHER POEMS.

THIS remarkable volume of poems was placed upon our table just as we were going to press. It is by a new author—Benjamin Hathaway, of Little Prairie Ronde, Mich., published by S. C. Griggs & Co., Chicago. We have only space to say that it is a surprising specimen of skillful versification. The whole volume is a rippling stream of poetic versatility, sparkling with the diamonds of true genius and the pearls of inspired thought that scintillate from its bed of golden sands. Those who wish a very rare treat should send for this western gem. Price one dollar.

THE NEW YORK POST-OFFICE.

THE wonders of postal work in a single city are illustrated by the following figures:—The letter-carriers of New York (nearly 500) make seven deliveries, and eighteen collection trips each, daily. In a single month they deliver, in round numbers, 10,847,000 parcels. Of these 47,000 are registered letters,—each, of course, containing money, or some other valuable articles; 4,500,000 letters by mail from a distance; 800,000 are postal-cards by mail; 3,000,000 are local letters; 1,000,000 are local postal-cards; and 1,500,000 are newspapers and other packages. In the same interval they collect 8,400,000 parcels, of which 6,000,000 are letters, 1,200,000 are postal-cards, and 1,200,000 are newspapers and other mailable packages, all of which are handled and received in or sent out of the great New York Post-Office at the lower end of the City-Hall Park. The wages of these letter-carriers amount to \$37,000 for this month's work.

THE BIBLE AND IMMORTALITY.

BY ELDER THOMAS MUNNELL.

THE doctrine of immortality is not *argued* in the Bible. Except in the presence of Sadducees, or other materialists, it is always assumed and counted on just as is the existence of God and the indestructible difference between right and wrong. In the absence of direct opposition no effort is made to prove it. And yet the Bible stands out as the champion of this doctrine, impressing, illustrating, and enforcing it upon the earthward tendencies of men. Intense study of the knowable, the visible, the sensible and belief in little else, shuts out the spiritual, and generates our doubts of the great Hereafter. Not only do bestial practices and general de-

baucheries destroy a sense of the spiritual in a Nero or a Tiberius, but a decent life may confine itself so devotedly to the investigation of physical science, and so habitually neglect the study of moral science, and of the spiritual hemisphere, that the very remoteness of the one and the proximity of the other start the doubt as to immortal life. It is freely admitted that a scientific investigator, not already subjugated by materialism, may learn much of God as the all-wise and immortal One by the most consecrated study of the minutest particles of matter, and that, too, even in its grossest forms; but as a great artist or mechanician is best understood by his perfected work, so God and the spiritual universe are more clearly comprehended from the highest than from the lowest forms of life. A man is a better viewpoint from which to study the question of immortality than an insect. Why should a monad have more to say about a future life than a Monad? Were the doctrine of Evolution even admitted to be true, and a Newton the outgrowth of a moneron, who would take the latter as the preferable exponent of "what we shall be?" When an artist has drawn only the rudest outlines of a portrait it is too soon to criticise or to tell whom it resembles. Wait for the last and finest touches of the brush; wait till you see the complexion, till it looks at you, till it almost breathes and speaks to you, and you have a better view of whom it aims to represent. But as there is not only no proof of such evolution, but the weightiest scientific and philosophical arguments against it, and as we are taught that man "was made" only a little lower than the angels in the beginning, it is most irrational to spend more time on insects and atoms than in studying the rational and spiritual hemisphere of being. Does a bioplast furnish as many and as decisive indices on the problem of human life as a Wesley? If so, then, as the vegetable bioplast under the mightiest microscope is indistinguishable from that of a man, it is just as plain a prophecy of our future as was Richard Baxter. But the Bible teaches us that he who is after awhile to be "equal unto the angels" is the one that came into being only "a little lower" than they; and reason would teach us that he bears far mightier prophecies, in his mental and spiritual organization, of immortality, than can be found in the organless organism of a moneron. Man is the half-way house between the kingdoms of flesh and of spirit. All above him is spiritual, and all below him is material, while both meet in him as the connecting link. Hence he is spoken of as living in a tabernacle or tent,—as one said, "I must shortly put off this my tent." The "inner man" inhabits the

"outer man," but even this body is to become spiritual, for "there is a natural body, and there is a spiritual *body*." The force by which this is to be accomplished is that power where-with God is "able even to subdue all things unto himself." Not only these bodies, but all material things, are to become homogeneous with the heavenly state,—new bodies, new heavens, new earth; no more sea, no more death, nor corruptibility, for "the former things shall have passed away." The fashion of this world having passed away—"the pest-bearing atmosphere, malarial waters, and all concomitants of death, as well as all the elements of death,—death itself, the last enemy, will thus be destroyed. As God is able to make diamonds out of carbon, it is not extravagant to believe that he can turn all gaseous, aqueous, and solid substance into incorruptible ornaments of that life which is yet to be revealed, nor is it too much to believe that science—true science—will yet more and more confirm the prophecy, "Behold, I make all things new."

OUR PAPER.

WITH this number of the *Literary Microcosm* we launch our tiny bark upon what has every indication of proving a stormy sea. Our editorial enterprise has been called into existence by a peculiar emergency. It was conceived in antagonism to the supremacy of authority in science and philosophy, and was born amid the clash of arms. It is a veritable "Daughter of the Regiment," inhaling its first breath of the odors of gunpowder, with the promise of its whole life a struggle—a warfare. *The Problem of Human Life*—a book which in a marked degree is radically in conflict with current scientific thought, and equally radical in its defense of religious philosophy—has necessitated a medium through which the public may be reached, and by means of which the representative authorities, whose teachings have been called in question, may be induced, if possible, to come to the front and show their hands in this mighty warfare between so-called science and religion, which they themselves have challenged and inaugurated. We are peacefully inclined to a degree, and love the quiet pursuits, especially at our time of life, which would smooth the rugged asperities of existence, rather than, panoplied with a warrior's armor, stand always in the line of battle ready for some menace of the enemy. But believing that Providence and a combination of circumstances have given us a mission to fill in vindication of principles and positions which we believe to be true, though in utter conflict with standard au-

thorities, we have not dared to shirk the responsibility, nor ventured to ask others to take up our scientific quarrel with the great representatives of advanced thought reviewed in our book, until such time as we have thus publicly demonstrated through the columns of this paper our willingness to bear the brunt of the campaign.

Since the book in question has been before the public in a quiet way, without a dollar of capital to push it or a single solicitation on the part of the publishers for a favorable notice, a full regiment of friends have rallied in its support and defense, most of them educated clergymen of every Christian denomination, but officered by many able professors of physics in our colleges and universities. The press, also, with two or three exceptions, have poured hundreds of voluntary and very handsome commendations into the office of the publishers, many of which, for enthusiastic praise, are unparalleled in the annals of book reviews. From the urgent solicitation of many of these friends (inquiring of us constantly if the great scientists reviewed in the book had ventured any defense) we have concluded at last to undertake the task of editing this paper, and thus aiding the press of the country in calling attention to the new scientific departures referred to, and, if possible, inducing the authorities reviewed to come to the defense of the theories assailed, that the exact truth concerning them may be known.

From several colleges, also, and from many teachers of natural philosophy, we have received urgent requests to formulate and prepare, and have published, a text-book on sound, to embody our new departure in opposition to the wave-theory. But we think this, at present, is premature, at least till the great representatives of the science of acoustics shall be fully heard. Besides, we are not the one to do this work, even if our ground against the wave-theory of sound shall be finally and fully sustained. Its formulation into a text-book should be the work of a committee of experienced professors of physical science who have made the department of acoustics their special study. Hence the necessity of this paper as a medium through which investigators may consult and be heard upon the subject.

Although scientific and philosophical investigation such as here intimated will form a prominent feature of this journal, yet it is by no means intended to make it specifically a scientific paper. Its character will be largely miscellaneous and *microcosmic*, as its title implies, somewhat in the style of the present number, though we hope, and may fairly promise, to improve it each succeeding num-

ber in general usefulness so long as its editor shall survive the struggle for existence. His aim, in these monthly communications with the public, shall be to do good, and thereby leave the world better and farther advanced in true knowledge for having aided him in establishing and sustaining this new journalistic enterprise.

May we not, then, ask our friends to send us good cheer as we make our bow and wave this salutatory, with a prayer for Heaven's blessing upon every reader of the *Literary Microcosm*?

SCIENTISTS, AND THE WAVE-THEORY OF SOUND.

ALEXANDRIA, VA., May 11, 1881.

MR. A. WILFORD HALL.

My Dear Sir:—I cannot resist the conclusion that by your exposure in *The Problem of Human Life* of the fallacies, contradictions, and absurdities of the wave-theory of sound as taught by Tyndall, Helmholtz, and Mayer, you have so loaded the theory with difficulties that it is no longer a tenable hypothesis. From a statement in your book, I learn that a copy has been in the hands of each of the three great scientists named for two years or more, without eliciting any reply. Nor have I seen from any quarter an attempt at the refutation of your book worthy the name. The criticisms which have come under my eye have been on points very trifling and unessential, and they do not begin to grapple with the real difficulties of the case.

It is merely idle and puerile to say, as we hear some "able men" do, that your book is a "hoax," and "unworthy of serious attention." Your exposure of the fallacies and absurdities of the wave-theory of sound are almost too startling and surprising to be credited, but I, for one, with the light now before me, cannot resist their conclusiveness. I marvel that the great teachers of the theory do not speak, if they have anything they can say.

I appreciate the embarrassments that would hinder others less celebrated in science from speaking until the great leaders had first been heard.

But surely some of the many professors of natural science and acoustics, in this country and in Europe, have the courage to defend what they teach their classes, if it admit of defense; and if it does not, then surely some of them have the candor and courage to confess the errors of their previous teaching, and to lend their aid to the reconstruction of the theory of sound.

Could you not, in your projected *Literary Microcosm*, offer space to representative scientists for a fair, candid, and courteous discussion of the questions at issue between you and them in regard to the wave-theory?

Yours, in the love of the truth,
WM. DINWIDDIE.

REPLY.

The above suggestion is a very important one. We are not only willing, but anxious to set apart one page of *The Microcosm** every month for the complete investigation of the Theory of Sound, and we take pleasure in announcing that if a representative advocate of the current theory, as taught in our schools and colleges, can be found, who is willing to undertake its defense, we will give him two full columns each month for one year, or longer, in which to present his arguments, and we will confine our reply to the other two columns of the same page. Such a discussion would, no doubt, be deeply interesting to professors and students of science, and in fact to every educated man or woman who tries to think scientifically. And we promise any physicist who may undertake this defense that he shall be fairly and courteously treated; and if any position favoring the wave-theory shall be logically sustained, or any position of ours against it fairly refuted, we will cheerfully acknowledge it, as we have nothing whatever to lose by the truth, whichever side it may go to favor.

We should, of course, greatly prefer Prof. Tyndall, of London, England, or Prof. Mayer, of Hoboken, N. J., as among the more competent investigators to do justice to this defense. But we dare not even hope for such good news to the scientific public. Still, why should not these eminent scientists take advantage of this excellent opportunity of reaching tens of thousands of scientific students, if they really believe in the correctness of the theory to which they have devoted much of their lives, and upon which they have written elaborate treatises? That they conscientiously believed it to be true when they wrote their books there is no doubt. Do they believe it now? If so, they surely ought not to refuse a defense of it, especially when professors of physics in our colleges and universities are announcing their conversion to the new hypothesis, and rejecting the wave-theory as "hopelessly shattered." To excuse themselves from this defense, as some of their friends are doing for them, on the ground that our arguments against these scientists are sometimes personally severe, will

*This paper, in its original form, was a four-column newspaper sheet of eight pages.

not satisfy scientific students who are searching for the truth, without reference to the nouns, verbs, or adjectives in which it may be couched.

If a man were trying to overturn your house by placing under its foundation wedges, jack-screws, and levers, you would hardly sit down quietly and allow him to proceed with his work because his mechanical implements happened to be crude and unpolished, particularly after you felt the building begin to shake! These distinguished scientists must already have felt the wave-theory tremble under their feet, as several experienced professors and entire colleges have rejected it, and publicly pronounced it a "scientific delusion." Yet, they say, in effect, let the fabric tumble, even though we believe in it, because the man who has assailed it does not happen to use just such words as we would prefer! We assure these writers, however, that thoughtful students of science will not be satisfied with any such feeble excuse as this. We await with some interest the answer, if any, which physicists will make to the foregoing proposition, that we may report it to our readers.

NOVEL USES OF THE ELECTRIC LIGHT.

SEVERAL Jockey Clubs of the South are discussing the plan of lighting up their race-courses by lines of powerful electric lamps, and having their races run at night. One great advantage will result from this. The spectators, as well as poor horses, will be protected in summer from the broiling rays of the sun.

A company is now negotiating with the government for a contract to light the City of Washington by placing around the dome of the Capitol a series of powerful electric lamps, aggregating several hundred thousand candles in brilliancy. It is proposed in this way to light the city to the distance of a mile in all directions better than it is usually done by street gas-lamps.

Pearl-fishing, it is now thought, can be conducted with great success by means of submerged electric lights in place of the old mode of employing divers. Incandescent lamps of the Edison form will be let down to the ocean bed, making it as light as the surface in daylight, while operators with suitable grappling tongs, at the surface, will pick up the pearl oysters and deposit them in crates sunken for the purpose at the depth of a hundred feet or more. Look out, now, for a supply of these lovely gems larger than have yet been seen, since aged oysters can be taken from a depth far beyond the reach of the old-time diver.

A REMARKABLE CASE OF EVOLUTION.

PROFESSOR HAECKEL says. "The life of every organic individual is nothing but a connected chain of very complicated material phenomena of motion. These motions must be considered as changes in the position and combination of the molecules; that is, of the smallest particles of animated matter, of atoms placed together in the most varied manner. The specific, definite tendency of these orderly, continuous, and inherent motions of life depends, in every organism, upon the chemical mingling of the albuminous generative matter to which it owes its origin."—*History of Creation*, vol. i., p. 199.

Now we submit that this is not bad for the descendant of an *ascidian*, whose "primeval parent" was a *moneron*, and whose less remote ancestors were *monkeys*, *marsupials*, and *lizards*! It forms a rare demonstration of the remarkable effects of heredity and environment, and a magnificent illustration of the powers of natural selection and the survival of the fittest. Who would not be an evolutionist?

A HINT THAT MAY PROVE VALUABLE.

WE venture to believe that many a reader of *The Literary Microcosm* will have his future determined, and the trend of his whole life shaped, by the influence of some chance article or even item which may fall under his eye in these pages. We hope to place within the 384 columns of each volume of this paper so many of such suggestive articles and items that the price charged for a year's subscription will be no consideration to the seeker after knowledge. A hint to the wise is sufficient. Read the offers, last page, first column, and then send us three cash subscriptions (\$1.50), and get the paper one year free.

NEW YORK CITY.

THIS is getting to be a wonderful metropolis. Ten cities and about fifty populous villages are properly included within New York as their business center, and go to make up its intrinsic population, the same as outside villages are counted in and absorbed to constitute the population of London, though our suburban towns, at the present time, are a little more scattered. In time, however, these villages, towns, and cities will expand toward each other, and all toward the great central, palpitating, business heart, till they will constitute one immense, unprecedented city of ten million people. At present this city, including the suburbs named, reaches very nearly 3,000,000 souls.

OUR CONTRIBUTORS.

SEVERAL communications from the pens of our contributors are compelled to wait their turn in future numbers of *The Microcosm*. We should have been glad to print all in this number, but it was impossible. They will "keep," however, and be welcome, no doubt, to our readers, when they appear.

We will add, that we do not, of course, undertake to indorse all that our contributors may say in their various papers, though we shall use such precautions in selecting articles as not to admit those which will not be generally useful, even though some things they contain may not admit of critical analysis.

A USEFUL INVENTION.

AS safe-robbing in banks and stores is becoming quite prevalent, and as it takes a gang of burglars several hours of hard work, under cover, successfully to accomplish such a job, we suggest, as a sure remedy for this class of robbery, that the safe be placed out doors on the sidewalk, and securely chained to the building—patent applied for! Inventors will take notice not to infringe this patent, as it might not be *safe* for them.

CASH-PRIZE SCIENTIFIC PUZZLES.

We propose to present, in each number of *The Microcosm*, a scientific problem, giving our readers till the issue of the next number of the paper to win the prize. We do not propose to make the successful competitor rich, as a reward for his achievement, but we aim merely to offer enough money to excite interest in the contest and to start every reader to thinking scientifically, and thus cultivate a love for the true principles of natural philosophy. We will try to propound such problems, from time to time, as have never, to our knowledge, been satisfactorily solved, though susceptible, as we think, of very simple and common-sense solutions. Many of these problems may strike the reader as too simple to require solution. But if he will come to look carefully after the *why* and *wherefore*, he will find that it has only been our familiarity with such simple phenomena which has prevented our realizing their truly marvelous and puzzling character.

In making our final decision as to the correctness or incorrectness of the various solutions of a puzzle, we shall be obliged to consult our own judgment principally, though where very fine distinctions require to be made we

will seek assistance among our scientific friends and correspondents.

All attempts at solutions of problems should be concisely and plainly written. We have no time for lengthy articles, nor are they necessary, as the true solution of any puzzle we may propound in this column will most likely be couched in very few words. Another thing may as well be said here, and that is, though we delight to hear from every friend who feels an interest in our success, it will be impossible for us to reply personally except to very important letters, as we are overwhelmed with correspondence growing out of the publication of *The Problem of Human Life* and the starting of this paper. Many of these letters, though from kind friends, we are forced reluctantly to leave unanswered. This we regret for many reasons, and trust such friends will not feel slighted. We aim to do all in this direction we can, and not overtax our physical powers to the point of snapping.

We expect to make this puzzle department a matter of interest to all classes of scientific thinkers, from the grave professor of physics to the tyro in science who has but taken his first lesson in natural philosophy. To this end we ask our scientific friends to send us any mechanical or other puzzles they may have chanced to note, that we may have as many as possible from which to select.

PUZZLE No. 1.—*Why does a hoop while rolling remain upright, though it falls as soon as it stops?*

We will pay \$10 in cash to the one who will first send us the correct solution of this problem, if sent before the issue of the next number of *The Microcosm*. The successful solution, if one is received, with its date, and the name and address of its author, will be published in the next number of this paper. If the true solution shall not be given by any one else, we will try to give it.

"*The Spectator*," of St. Louis, Mo.—a weak imitator of its great namesake—having its envious soul stirred by the favorable notices of *The Problem of Human Life*, dismisses its arguments against evolution and spontaneous generation as all "bombast." We suppose this bilious traducer of what he has not read and is not capable of understanding, ought to be permitted to indulge his spleen in the interests of his friends, Darwin and Haeckel, if it affords him any amusement, since even a yellow dog has a right to bark at the moon without molestation. For the benefit of those who have not seen *The Spectator*, we will say, if any man

should desire to experience the peculiar sensation of eating a bushel of chaff to get one grain of wheat, we would advise him to wade through the original matter of just one number of this burlesque on journalism.

The Microcosm, we are pleased to state, indicates a very large circulation, even before a copy of it has been seen. By its bare announcement through a prospectus, thousands of subscribers have already sent in their names, and are rallying to its standard, as we go to press, with an enthusiasm which bids fair to reach 50,000 or more before the year is half out. We believe there are a million thinking men and women in this country who approve of a bold and fearless discussion of science and religion with their concomitant issues, and who would be pleased to read this journal if their attention were properly called to it. Let every reader who may approve of our course, either in the *Problem of Human Life* or as indicated in this initial number, aid our enterprise if he can and will.

READ the reply to the New York *Christian Advocate* on another page of this paper. The management of that great journal will no doubt use a little more caution in its future selection of book reviewers, and not place such responsible work in the hands of a conceited blunderer who does not know the difference between the terms *phylogeny* and *philogyny*. The editor has our sympathies in his unpleasant dilemma; but it was his own fault, as he should have come out at the very start of the correspondence and washed his hands of the whole matter by placing the blame on the stupid shoulders of his reviewer, and not become his scapegoat, as he has, by trying to shield him. He will know better next time.

DR. HAZARD ON MATERIALISM.

THE following are the opening letters of a correspondence between Dr. Wm. B. Hazard, editor of *The Clinical Record*, of St. Louis, Mo., and the editor of this paper, involving some nice points in materialistic philosophy, and in which the reader will no doubt become interested as the discussion proceeds. The correspondence originated in this wise. In a recent number of *The Clinical Record* the Doctor took occasion to notice *The Problem of Human Life* in a very short and quite unfavorable criticism, pronouncing its teachings even more materialistic than the doctrine of Haeckel and Huxley, which the book opposes, closing with a sarcastic

apology to his readers for taking up so much of their valuable space! Our attention having been called to this contemptuous notice by a friend in St. Louis, we quietly sent the Doctor a copy of the revised book, accompanied with a brief note, requesting his candid perusal of the volume before attempting to review it in his paper. To this note he replied in the letter given below, the occasion being so opportune to give us a little private instruction on materialism, prior to his forthcoming review in *The Clinical Record*, that he could not forego the temptation of ventilating his views, after acknowledging receipt of the book. This, above all things else, was what we most desired, and were really tempted to suggest it in our brief note, but dared not lest the Doctor should "smell a mice" and keep mum. Emboldened, however, by our lamblike note accompanying the book, he precipitated his very leaky craft upon the hazardous sea of materialistic mixification with the result which the reader will observe, should he read this and the next few numbers of *The Microcosm* :—

ST. LOUIS, Dec. 7, 1880.

A. WILFORD HALL, ESQ.,

26 East Ninth Street, New York.

My Dear Sir: Your very kind note of Dec. 3, with the copy of your work, were both received last evening, for both of which please accept my sincere thanks.

I have carefully re-read the preface, and examined the first chapter already, and shall endeavor to read the entire book, as you desire.

I greatly fear, however, that we shall be no nearer an agreement on certain points, after I have read the entire argument, than before.

We have one point in common—an earnest belief in an all-knowing Almighty God. Another—that "truth is mighty, and must prevail."

Like Faraday, you seem (to me) to be unable to conceive of force (or motion) as anything except another form of matter. To me, force and matter are essentially distinct from one another, although I cannot figure to myself one separated from the other. Recognizing that force (or motion) although changing its form, is, like matter, incapable of destruction, I see no improbability in the hypothesis that both may exist without limit as to time. Regarding both matter and force as having equal value in the sight of their Creator, I see no possible inferiority in either as regards the other.

As you deem the overthrow of the evolution hypothesis of such vital importance, it seems to me, that you have risked too much on your ability to refute the wave-theory of sound. To my mind, you have not succeeded. Even if you have thrown doubt upon it (which I cannot

admit), your own hypothesis is as full of difficulties, and, pardon me, I came near adding absurdities.

I must congratulate you upon the success of your book, upon its excellent style, its kindly tone, its brilliant satire, and earnestness of purpose. I am sure it will do good. It will arouse inquiry, and *truth* must be the gainer.

Unlike you, I see no conflict between science and religion. Both seek the truth—perhaps by different methods—but always the truth. For my own part, I have no pet theories that I would not most cheerfully sacrifice in the interests of eternal verity.

Again thanking you for your courteous notice of my poor criticism, permit me to remain,

Very sincerely yours,

WM. B. HAZARD.

5 South High Street, St. Louis, Mo.

P.S.—Have you ever seen the “double siren” in action, and examined for yourself the supposed phenomenon of “interference of sound-waves producing silence?” I have not, and your explanation of the results seems, theoretically, correct (page 289, revised edition).

REPLY.

26 East Ninth Street,
New York, Dec. 20th, 1880.

Dear Doctor Hazard: I have your kind letter of the 7th inst., acknowledging receipt of *The Problem of Human Life*. I am pleased that you have resolved to read the book through, and that you had already examined the first chapter. I am also delighted that you have made free to express your views frankly upon certain topics discussed in the book, as this frankness on your part opens the way for an explanation by me which may be of service to you, and greatly aid you in reaching the truth as regards the various matters discussed in the “*Problem*.”

But there is one thing I regret to notice in your letter. You seem to me to be in too great haste in bolting the door of your intellect by prejudging the arguments of the book before you had read them. You say, “I greatly fear, however, that we shall be no nearer an agreement on certain points, after I have read the entire argument, than before.” Now the arguments and points to which you refer are those, of course, upon which you commented in *The Clinical Record*, namely, materialism, and the substantial nature of force, which are not discussed at all in the first chapter of the *Problem* (revised edition), the only portion you had examined. I regret this hasty prejudgment. When you shall have carefully read the

second, third, fourth, and seventh chapters, you will have a much better basis for a just opinion and criticism than when you published your brief review of my book in the *Record*. And, let me say, I do not believe it possible that we shall differ very widely upon any essential point involved in the discussion, after such careful reading, especially in view of your grand admission of “*an earnest belief in an all-knowing Almighty God!*” Allow me further to add that, had you read these chapters before writing your letter, you would not have fallen into the error of confounding *force* and *motion*, which you use as *synonymous terms*, and leave the impression that I take the same view. But I distinctly teach, on page 70, that *motion*, like the *property* of a body, is not *substantial* or *entitative*, being only the act of a body in changing from one position to another, and necessarily ceases to exist as soon as the body comes to rest. Not so with *force*, which, so far from being the same as motion, is, in fact, the *cause* of motion, and, as I endeavor to show, is necessarily *substantial*, though not of necessity *material* in the gross or corporeal sense of that term. This distinction between corporeal and incorporeal *substance* you seem entirely to overlook, because, in your notice of the “*Problem*,” in your excellent journal, you make the impression that, because I assume the substantial nature of the forces, such as magnetism, gravitation, sound, light, &c., I reduce these forces to *material*, in the corporeal sense, and thus you make me a *materialist*, equally with Haeckel and Huxley. Had you called me a *substantialist*, you would have been precisely correct. Please note this important distinction. Or had you given a second’s thought to what *materialism* signifies, you could not so far have mistaken my views. Let me give you a definition that the whole world will admit. *Materialism* is a belief that our corporeal bodies are all there is of us having an *entitative existence*—that the life, soul, mind, or spirit, is nothing but the complex *motion* of our physical molecules, and that, when this *motion* ceases, life and mind necessarily cease to exist. Hence materialism teaches that the soul is nothing but *molecular motion*, and can have no existence separate from this corporeal organism. This is *materialism*. In opposition to this view, I have maintained, in some form, on almost every page of my book, that the soul, life, mind, or spirit of man is a real *substantial entity*, distinct from the corporeal organism, being the *force* which moves the physical molecules, and hence must exist after the physical body is dissolved. To substantiate this view, I show that even the incorporeal forces of Nature, such as *magnetism*, *gravitation*, *sound*.

light, heat, and electricity, must of necessity be substantial in the incorporeal sense, and that this was what led me to attack the wave-theory of sound, and try to show that sound was a real or substantial thing, and not merely a mode of motion, like that of the materialistic view of soul and life. Yet you fail to discriminate between my views of life and force and those of Haeckel, pronouncing them, in your former notice, equally materialistic.

Let me illustrate the self-evident distinction between a substantial *force* and a mode of *motion*. The *water* which moves a wheel is surely distinct from the wheel's *motion*, or that of the water, even. The *steam* which moves a piston is surely not the *motion* of the piston, nor is it the *motion* of the particles of the steam. You cannot conceive of the *water* and *steam* except as the moving *forces* that displace the wheel and the piston, nor except as substantial agents, though the one is vastly more attenuated than the other. So the *magnetism* (still more attenuated) which darts off from the poles of the magnet and moves the armature, is surely not the motion of the armature, but rather the substantial *force*, which produces the motion. In each of these cases the *force* is the substantial *cause*, while the *motion* of the wheel, the piston, and the armature, is the *insubstantial effect*. It seems to me that a mind accustomed to close and careful thinking can scarcely fail to grasp this distinction. Then I only need to lead you a step further to show you that the *life-force* which acts within us, though invisible and intangible like magnetic rays—that agent which moves the molecules and bioplasts of our bodies—cannot and must not be confounded with such *motion* itself, a mistake into which all materialists have fallen, as may be seen by reference to Prof. Haeckel's *History of Creation*, vol. i., page 199. You seem also, inadvertently, to have fallen into the same error, by confounding the *motion* of a body with the *force* that produces it. You are no doubt excusable for this, not having had your mind specially directed previously to this branch of *physical metaphysics*. A moment's thought, however, will set you right. You will see that the *water* that moves the wheel must necessarily be a *substance*, or it could not move it. That the *steam* which moves the piston is unavoidably *substantial*, or the piston would not move. Hence you cannot be so illogical as not to see that the *magnetism* which moves the armature must also be a *substance*, though not a material or corporeal substance. This being so, it follows that the *life-force*, which moves the molecules and organs of our bodies, must be as really substantial as is the force which moves the armature, the piston, or

the water-wheel, though they all four differ in degrees of tenuity. No materialist, it seems to me, can make any kind of reply to this reasoning.

Having thus tried to show you, by the most simple and logical sequence, that all force, including *life-force*, must be substantial, it follows that the life, soul, mind, or spirit, being entitative, is indestructible (since all science agrees that no substance can be annihilated), and must therefore have a substantial existence after death. And, if this be so, materialism falls to the ground. Which, now, Doctor, I ask you, is the more beautiful or philosophical view of the problem of human life, the materialistic view, that life is but the *motion of our physical molecules*, which necessarily ceases to exist at death, or this substantial view of life, mind, soul, and spirit, and the consequent existence of the *real man* after the death of the body, to which every page of my book distinctly points?

But, possibly, I mistake you. Possibly you are not a materialist at all, but a believer in the doctrine that man—the *real man*—the spirit, soul, life—will exist after the body dies. If you do believe this, then I am combating Haeckel, Huxley, Comte, Spencer, Bain, and not my friend, Dr. Hazard, at all. What makes me suspect that you are not a materialist, but a believer in the conscious existence of the soul of man after death, is the fact that you have an "earnest belief" in the personal existence of "an all-knowing Almighty God." I say *personal* existence, because a "*knowing*" God cannot be conceived of except as a *person*. Then, if one intelligent person or being can exist, capable of "*knowing*" or thinking, outside of a physical organism, surely a thousand million worlds-full of intelligent beings, might live, and die, and still exist as "*knowing*" personalities, without possessing corporeal organisms! Thus your grand admission of an "*all-knowing, Almighty God*," forms a rational and philosophical basis for the conscious and personal existence of man after death.

A word in regard to my attack upon the wave-theory of sound. You think I have risked too much in attempting to overthrow that theory; and you add your belief that I have not even succeeded in casting a doubt upon it. I regret, for your own sake, that you have not more carefully studied my arguments. Prof. Brockett, A.M., of Western Maryland College, thought the same, and tried to show wherein I had failed to cast a doubt upon that ancient theory. It might interest you to read his objections and my reply, in Addenda to Chapter VI., commencing at page 335. On the other hand, a score of professors of physical science,

who have taught the old theory of sound in colleges and universities for many years, some of whose names appear in the Addenda have already surrendered to the new departure, and acknowledged that the wave-theory has been "hopelessly shattered" by my arguments. I have just received a copy of the *Dexter* (Iowa) *Herald*, of Dec. 3, 1880, edited by Prof. Henry C. Cox, A.M., for fifteen years professor of physical science, including acoustics, and in an editorial on this book he says:—

"We believe it to be the ablest scientific work written in a hundred years. . . . The first part of the book is given to a discussion of the wave-theory of sound, and so completely does he show the absurdity of that hypothesis *that we feel mortified to reflect that for fifteen years we taught it for science.*"

Yet you believe that I have not cast a doubt upon it, though in your postscript you acknowledge a very serious doubt in the fact that my explanation of the action of the double siren (in direct opposition to the explanation of Prof. Helmholtz, the man who invented it, and the greatest living acoustician), "seems theoretically correct." If my explanation of that instrument be "theoretically correct," then the so-called law of "interference" is, of course, false; and the wave-theory, based upon it, necessarily breaks down.

One other word before closing this somewhat lengthy but friendly letter. You take occasion to remark, "Unlike you, I see no conflict between science and religion." And, I will add, neither do I. How you could have so misapprehended the spirit and letter of my book is more than I can conceive. It is only "science falsely so-called" that conflicts with religion, and this distinction between true and false science, and between the latter and religion, I am very careful to observe throughout my entire argument. All true science is a part of God's revelation to man in the book of Nature; and it is only the true religionist who is qualified to appreciate or properly expound God's grand revelation in the volume of science, while it is equally impossible for the true scientist (as shown in the last two pages of *The Problem of Human Life*) to oppose the hypothesis of the immortality of the soul.

Your most sincere friend,

A. WILFORD HALL.

THE REVIEWER REVIEWED.

WE have waited with patience for the issue of this number of *The Microcosm* for an opportunity to pay our respects to the New York *Christian Advocate*, in return for a so-called review of *The Problem of Human Life*, which,

perhaps, has few if any parallels for inexcusable injustice. We regret to say this about a paper professing to be a Christian journal. It is scarcely possible to believe that a minister of the Gospel, occupying a position as responsible as that of editor or book-reviewer of a great religious paper, could stoop so low as deliberately to falsify a book and defame its author, because certain portions of the argument crossed his own track or that of his friends. Yet this is clearly the animus of the writer of the notice to which we now call attention. We might safely have allowed it to pass without a remark, so far as concerns those who have read the book, hundreds of whom have written us, blessing God and thanking the author for this work; but the notice in *The Advocate* has no doubt, as it was intended to do, reached hundreds of ministers who have not read the book, and who would, after seeing such a notice, be deterred from taking it up. The great injustice of such attack, after sending to us for the book for review, justifies, in the opinion of scores of Methodist ministers who have written us upon the subject, our giving the facts to the public through this paper, and thus letting the reviewer (as well as his abettor, Dr. Buckley, the editor), stand in his true light before the ministers and laymen who support that journal.

On the sixth of last January Mr. Thomas, secretary of *The Advocate*, wrote us a note asking for a copy of the book for review in his paper. In good faith, we sent it to him as requested. On the third of February the notice appeared, the substance of which we here quote:—

"We do not know whether this author be young in years. We hope he is. If he be mature, his book leaves us without hope as to his future. If he is young, the discipline of life may bring his knowledge to a wiser use than that to which he has put it in his volume. There are Christian answers to the doubts and denials of anti-Christian scientific men. This purports to be one, and is not. What can be said of a book on so grave a subject which, in its table of contents, misspells common English words, confounds philosophical terms, denies vibration to the tympanum, says that the soul has eyes, ears, and brain, size, shape, and appearance? One might well be excused from reading such a book through. But this was read through, because it is widely advertised among our ministers, and inquiry has come from them to this office concerning it. We were early taught that wisdom is the right use of knowledge. This book is knowing, but not wise. Tyndall, Dr. McCosh, Prof. Gray, Joseph Cook, Spencer, Huxley, and Haeckel, all come in for indiscriminate condemnation."

Now the only part of this notice which really injures the book, or is worthy of a reply, happens to be that portion which has no foundation in truth. Fortunately, the reviewer's vaulting ambition induced him to specify the

"table of contents" in which the misspelled and confounded terms occur, on account of which the author is branded with ignorance, and his book condemned as unworthy the notice of ministers. But the reviewer never dreams, in his amiable intent to ruin the book, that even should such faults really occur they might be the result of typographical errors, which are found more or less in all books. How noble to attack a prominent book on account of a typographical error! Even in that very number of *The Christian Advocate*, containing this stone hurled from a glass house, and on a single page, occur *five* such fatal errors,—*monstrous faults*, according to the standard of this reviewer,—sufficient to condemn this widely circulated journal, and cause all good men to warn ministers against reading it! We will not make this charge in general terms, as did our reviewer, and then skulk the responsibility, but we will point out the words, columns, and lines, for verification. On page 76, second column, 24 lines from bottom, the great Russian General *Skobeleff* is spelled "Skobeloff." Same column, six lines above, *Mr. Gladstone* is recorded "Mr. Mr. Gladstone." In the next column, 16 lines from bottom, King *Kalakaua* is spelled "Kalakana." A little farther up, same column, *against* is spelled "agaist." And still a little farther up, fourth column, *who* is spelled "whe!" Now "what can be said of a" paper? &c., &c.! Really, if any critic who might review *The New York Christian Advocate* should seriously make a point of these errors against the editor, or even refer to them, for the purpose of disparaging the value of that great journal, he would justly invoke the disgust of every intelligent reader of his criticism, and would be set down as a literary ass of the longest-eared type. But what would be the just characterization of such a charge, when, in addition to its meanness, it turns out, as in the case of Dr. Buckley's employe, to be utterly *false* in point of fact?

As proof that the charge in *The Advocate* is false, and that Dr. Buckley, the editor, knows it to be so, but has not the Christian manliness to confess it, we will here give a little history of the case which will interest the reader, and, if we mistake not, will make the cheeks of the noble army of ministers who support that paper tingle with shame when they come to be informed of the facts. Immediately on receipt of *The Advocate* containing this notice, we wrote Mr. Thomas, as he was the one who sent for the book, politely requesting to be informed of the misspelled and confounded terms charged as occurring in the "table of contents" of the *Problem of Human Life*. No reply came. In

about a week or ten days we wrote him again, demanding as our just right, and that of the author, to know what these misspelled and confounded terms were, as specifically charged. Mr. Thomas replied by card, simply saying that he had passed our letters into the hands of the reviewer. We immediately responded that this was not satisfactory. That it was through his agency the book was obtained for review, and that he owed it to us and to the author, in courtesy and Christian justice, to obtain from the reviewer the terms charged as misspelled and confounded, and report them to us, that we might correct the electrotype plate; or, if he would not do this, that he should give us the name of the reviewer, that we might communicate directly with him, and thus obtain the information to which we were justly entitled. No reply came. About a week later we wrote our fourth letter to Mr. Thomas, emphasizing our former demand, and specifically charging falsehood and slander upon the writer of the review; and intimating, if justice were not done, that other steps would be taken to secure it. Mr. Thomas then answered promptly, informing us that our letters and the whole case had been handed over to Dr. Buckley, the editor, for arrangement. We then wrote Dr. Buckley a letter, sending it by the hand of a friend, and making the same demand, inclosing a copy of the table of contents, and also a copy of the book, and insisting, in Christian fairness and simple justice, that the terms charged as misspelled and confounded should at once be pointed out. Dr. Buckley answered in the following words, but without the slightest allusion to our just demand:—

"Messrs. HALL & Co.

"We have confidence in our reviewer. I am examining your book. If I find that substantial injustice has been done, it will be rectified, if not, nothing further will be said about it.

Respectfully,

J. M. BUCKLEY."

To this letter we replied, assuring the Doctor that he had not touched the point in controversy. We repeated our demand for a specific statement of the misspelled and confounded terms charged in *The Advocate*; and informed him, in the most positive manner, that we regarded the charge as false and libellous; and that we would hold him individually and publicly responsible, unless he washed his hands of the matter by compelling the reviewer to point out the misspelled and confounded terms referred to. To this letter no reply came. After waiting about two weeks longer we wrote him our last communication, which can be no better presented to the reader than by copying the letter itself, verbatim, as follows:—

"26 East Ninth Street,
New York, April 18th, 1881.

"Rev. Dr. BUCKLEY.

"Dear Sir: About two weeks ago we wrote you a letter, urging you, in the strongest language we could command, to answer us at once and point out the confounded and misspelled 'philosophical terms,' charged in your paper as occurring in the 'Table of Contents' of our book, *The Problem of Human Life*. That letter was the sixth we had written you and Mr. Thomas, your secretary, insisting upon the Christian fairness, not to say legal justice, of our demand, the last one being in reply to yours of the 2d inst., in which you say: 'We have confidence in our reviewer. I am examining your book. If I find that substantial injustice has been done, it will be rectified,' &c.

"Now, we ask you, again, how long does it take to read that 'Table of Contents'? It surely does not require two weeks to examine a single page to decide whether your reviewer has told the truth or penned a deliberate falsehood, and thus ignorantly or wickedly slandered both the book and its author! Besides, you must have read this table of contents before you wrote that letter expressing 'confidence' in your reviewer, as you had it inclosed with our previous letter ten days before, in which we urged you to require your reviewer to mark on the margin the philosophical terms charged, and return it to us. You make no reply to this, except to assure us that you have confidence in your reviewer! In the name of Christianity, and in the name of high-toned Christian journalism, what does this mean? Do you suppose that you can screen your reviewer behind your high editorial chair from the consequences of a wicked and libellous charge, and neither of you be brought to account for it? By your expression of confidence in him, with that table of contents before you, and in view of your undoubted knowledge upon the subject, you become *particeps criminis* in law and equity, and will be so adjudged by the hundreds of Christian ministers who read your paper, when they shall come to learn the facts of this case, as they most assuredly will, in due time. Can it be possible that you are as ignorant of 'philosophical terms' as your reviewer, and that you really suppose him to be correct in that charge? Either this is the case, or else you know that he has libeled the book, and have not the manliness and honor to acknowledge it. No other conclusion can be drawn, since you decline to point out the 'philosophical terms' charged, though urged to do so in six different letters.

"But we do not believe you to be ignorant of the proper meaning or orthography of the 'philosophical terms' in that table of contents. On the contrary, we assert our belief that you are now well aware, and have been since you read our first letter to Mr. Thomas, more than six weeks ago, that the reviewer, in whom you express 'confidence,' told a stupid and unqualified falsehood about the book; and that this, in charity, was the result of his own illiteracy in regard to the meaning of philosophical terms and his inordinate self-conceit. We assume that you know this to be the case, because you are not a 'vituline youth.' Why, then, do you try to cover him up with your editorial mantle of expressed 'confidence'? If you did not know him to be guilty, or, in other words, if you believed him to be correct in his charge,

would you be likely to endure half a dozen such letters as this, and not resent them by thrusting the confounded and misspelled 'philosophical terms' into our teeth, and thus end the matter? You can depend upon it, Dr. Buckley, as surely as you live, that unless you settle this matter at once by a manly and honorable confession of your reviewer's guilt, or else designate the confounded and misspelled terms charged, you will cover your editorial robes with infamy as black as that which will cling to your illiterate and libellous reviewer.

"This is our last letter to you upon this subject, and we await your decision with some degree of anxiety for your own reputation as an editor and minister of the Gospel.

"Very sincerely yours,
"HALL & Co."

The foregoing letter we know to have been received, as Mr. Thomas sent us a card the next day to that effect. But up to the time of going to press not a word has been heard from Dr. Buckley, nor has a syllable appeared about the book in *The Christian Advocate*. Among the many disapprovals of *The Advocate's* attack upon *The "Problem,"* from Methodist ministers who have read it, we can only make room for the following brief extract from a long and scathing review of Dr. Buckley's course in *The Corsicana (Texas) Messenger*, by Rev. Dr. S. C. Littlepage, of Bryan, Texas, for years Presiding Elder in that district, and one of the ablest clergymen of the M. E. Church South. His opinion of the review, and of the animus of the reviewer, will speak for itself. We would be glad to copy the entire reply of Dr. Littlepage, but this will have to suffice:—

"The cool impudence of the article in question, after the enthusiastic indorsement of such men as Doctors McAnally, Kavanaugh, Bird, Prof. Boyle, Dr. Dinwiddie, of Alexandria, Va., and hundreds of ministers of all denominations, north and south, is simply refreshing. I could but exclaim, when I first read it, 'Upon what meat doth this our Caesar feed, that he is grown so great?' He asserts, hisses, proves nothing, and quits. When thousands of Christians of every name are blessing God in their hearts, and with their lips and pens, that in this dark day of danger to theology and practical religion, when the Church is environed and invaded by Darwin and the devil with weapons so formidable and numbers so great that even Dr. McCosh, Joseph Cook, and other great and good men, are asking permission still to believe in God, although 'the foundations be destroyed,' God in his providence has raised up this fearless defender of the faith, who, with pick and shovel, throws the so-called scientific rubbish of Darwin, Tyndall & Co. to the winds, and shows the thinking world that the 'pillar and ground of the truth' is 'still there,' undefaced and unaffected. It is humiliating, not to use a stronger term, when one has rendered so valuable a service to the cause of truth, for such a journal as *The New York Advocate* to scout it and condemn it in a pretended review, where every damaging material fact referred to is falsified as can be easily shown. Are great and good men, 'sincere Christian workers,' as Wil-

ford calls Dr. McCosh and Joseph Cook, above criticism? Does anybody claim infallibility for them? Or does Dr. Buckley imagine that they belong to a mutual admiration society, and that they will take him in on the cheap terms indicated in his review? I do hope that some Methodist preacher, to the manor born, will do the M. E. Church the credit to rebuke the meanness of this assault; and it can't be done too soon."

It will be noticed that Dr. Littlepage credits the review in *The Advocate* to the pen of Dr. Buckley himself. If he has taken the correct view of it, and it really begins to look so, then it explains the passage in Dr. B.'s letter, "*We have confidence in our reviewer!*" And it also explains why he so persistently refuses to reveal the reviewer's identity, or to point out the "philosophical terms" charged as misspelled and confounded.

The truth is, we have found out the real difficulty in this case, and the actual *terms* referred to, though we could not succeed in torturing them out of Dr. Buckley, or his secretary, with all the thumb-screws we could apply in seven consecutive letters. We have it, however, from a source that we regard as perfectly reliable. The facts are these. The reviewer, in examining the table of contents, chanced to light upon the *philosophical term* "phylogeny," (used to signify tribal descent), in the contents of Chap. VII., and, not knowing its signification, he turned to Webster, and, behold! it is not yet there, though this identical word is used more than one hundred times by Prof. Haeckel in his recent works, the *History of Creation* and the *Evolution of Man*. By a little searching through Webster, however, the reviewer found the term *philogyny*, an entirely different word, and from another root, signifying "*fondness for women*," and in a glee of egotistical triumph he wrote his "review," charging the author of *The Problem* with ignorantly misspelling common English words, and confounding philosophical terms! Had it not been for his own illiteracy and self-conceit, he would have examined the citations from Prof. Haeckel's book, referred to in the table of contents, and would have learned that the term *phylogeny* is derived from *phylum*, a tribe, from which also comes our word *phylarch*, "the chief of a tribe." But, unfortunately, the poor egotist, looking anxiously for some defect upon which to fasten, struck the wrong *philogyny*, which has muddled many a head stronger than his! Hence all this retribution, and possibly more yet to come; for, unless we mistake the spirit of the Methodist ministry who support that journal, somebody will receive a polite invitation to step down and out at 805 Broadway, before the present Conference year has expired.

In conclusion, we challenge Dr. Buckley to deny the correctness of the explanation here given of the circumstances which led the unfortunate reviewer, whoever he may be, into his pitiable predicament, while we pause for a reply.

HALL & CO.

THE FOURTEEN WONDERS OF THE WORLD.

THE seven wonders of the world, in ancient times, were the Pyramids of Egypt, the Pharos of Alexandria, the walls and hanging gardens of Babylon, the Temple of Diana, the statue of the Olympian Jupiter, the Mausoleum of Artemisia, and the Colossus at Rhodes.

The seven wonders of the world in modern times are the printing-press, the steam-engine, the telegraph, the daguerrotype, the telephone, the phonograph, and the electric light.

The so-called "Seven Wonders" of the Ancients were mere trifles compared with those of the present time. The Brooklyn Bridge, for example, would make the hanging gardens of Babylon a mere toy, while the whole seven wonders put together would sink into insignificance could their builders have seen a lightning express train at full speed.

MICROCOSMIC DEBRIS.

According to the late census there are 245 towns and cities in the United States having a population of 10,000 and upwards.

Gen. Walker, the Superintendent of the Census predicts that the census of 1890 will give the United States a population of 64,467,000.

There are truths which some men despise because they have not examined them, and which they will not examine because they despise them.

There are fifty kinds of flowers growing in the Arctic regions which are to be found nowhere else. Most of them are of a white or yellow color.

A Paris manufacturer claims to have discovered a process for substituting the leaves of the eucalyptus-tree, which in burning emit a delicious perfume, for tobacco-leaves in making cigars.

Cinchona gets its name from Ana de Osoria, Countess of Chinchon, who in 1640 brought with her to Spain from Peru a supply of Peruvian bark. Hence the genus *cinchona* of Linnæus.

Even so inflammable a material as cotton can now be used for the construction of fireproof buildings. The raw cotton is converted into a paste by a chemical process, and this paste becomes as hard as stone. It is molded into large slabs, and designated as architectural cotton.

The tallest trees in the world are in Australia. A fallen tree in Gippsland measured 435 feet from the root to the highest point of the branches. Another, standing in the Dune-nong district, in Victoria, is estimated to be over 450 feet from the ground to the top.

The Locomotive publishes engravings showing how boilers look after they have exploded. This doesn't seem to meet the case at all. What is needed is a picture showing how a boiler looks just before it is going to explode. We could then learn when to get out of the way.

According to the statistics made by one who has an opportunity of knowing, there are 13,000,000 milch cows in the United States, and 52,000,000 acres of land to furnish feed for that number. The milk produced by the cows annually, at 12 cents a gallon, is worth \$695,760,000.

Algiers possesses a river of veritable ink. Two streams, one starting from a region where the soil is ferruginous, the other from a peat-swamp, meet and form the river, whose inky constituency is due to the mixing of the iron and the gallic acid which the two tributary streams respectively contain.

A Philadelphia scientist recently made, in the *Christian Register*, an honest, but, if we mistake not, reluctant confession: "Our science of Nature, like our science of man, is a patch-work of half-stated, half-worked-out sums on a slate; and we are kept as busy with the sponge as with the pencil."

Mr. Whitney, a Massachusetts man who has lived in South Africa, proposes to introduce the raising of ostriches in San Bernardino County, California, starting with one hundred pairs. He says that twelve years ago only forty ostriches were domesticated in South Africa where now there are 150,000.

A recent writer says that the stormy petrel possesses a singular amount of oil, and has the power of throwing it from the mouth when terrified. It is said that this oil, which is very pure, is collected in St. Kilda by catching the bird on its egg, where it sits very closely, and making it disgorge the oil into a vessel.

Some strange phenomena have recently occurred on Long Island Sound. A steamer narrowly escaped collision several times on a foggy

night, although she sounded whistles, and there was no reason to doubt that the steamers she came near running into sounded theirs. The fog seemed to prevent the whistles from being heard more than a very short distance.

Hodscha-Ahmet, who was sentenced to imprisonment for life for having translated the Bible into Turkish, and having circulated it in the States of the Sultan, escaped from the prison at Chio after the recent earthquake. The prison was thrown down by the violence of the shock, but Hodscha-Ahmet was not hurt. He managed to get on board an English vessel anchored in the harbor, and he is now in London.

The great salt-mines of Cracow, in Poland, employ 500 to 600 men at a time, and are, in fact, underground cities, with streets, roads, and a large population of human beings and horses. In these mines the natural salt forms the sides, roofs, and floors of a series of vast caverns; and when the men are all at work, and the light gleams from torches and lanterns on the toiling figures and glittering white crystals, the scene is very striking.

Shakspeare uses more different words than any other writer in the English language. Writers on the statistics of words inform us that he uses about 15,000 different words in his plays and sonnets, while there is no other writer who uses so many as 10,000. Some few writers use as many as 9,000 words, but the great majority of writers do not employ more than 8,000. In conversation, only from 3,000 to 5,000 different words are used.

The infant human jaw recently found in Schipka cavern, Moravia, seems according to Prof. Schaaffhausen, to be one of the most remarkable relics of palæolithic man yet discovered. To judge by the development of the teeth, the jaw belonged to a child of less than a year old, but its size and the size of its teeth is that of an adult. In many respects it shows intermediate peculiarities between those of the lowest existing savages and the anthropoid apes. [Doubtful. *Ed.*]

The number of elementary substances recognized in chemistry has now reached over sixty-four, though for many years past it has been expected that this number would be diminished rather than increased by the discovery that these supposed elementary substances are really various compounds of a few. Spectroscopic observations and chemical mathematics can be made to demonstrate that probably the four remarkable substances—oxygen, hydrogen, nitrogen, and carbon,—constitute the whole earth and its inhabitants.

Last summer Mr. H. F. Osborne bought a pair of prairie-dogs in Colorado, and took them to his home in Newark, N. J. In December he decided to give them their customary winter sleep under the ground. He had a deep hole excavated in his garden, and placing the dogs therein in a box, with a piece of carpet for bedding, he shoveled in the earth until the box was buried several feet. In April the box was dug up, and the dogs were found close together in sound sleep. They were taken into the house, and quickly regained consciousness. They played together, and seemed to be well and strong.

YOUTH IN OLD AGE.—Longfellow, the poet, thus writes on growing old: "To those who ask how I can write so many things that sound as if I were a boy, please say that there is in this neighborhood, or neighboring town, a pear-tree planted by Gov. Endicott, two hundred years old, and that it still bears fruit not to be distinguished from the young tree in flavor. I suppose the tree makes new wood every year, so that part of it is always young. Perhaps that is the way with some men when they grow old. I hope it is so with me."

PRODUCTION OF METALS.—During 1880 the production of metals west of the Missouri river, including British Columbia and shipments to San Francisco from the west coast of Mexico is as follows: "Gold, \$33,522,182; silver, \$40,205,364; lead, \$5,752,390; copper, \$898,000. Colorado leads with a total of \$21,284,989; California follows with \$18,276,166; Nevada, \$15,031,166; Utah, \$6,450,953; and Arizona, \$4,472,471. In comparison with the product for 1879 California shows an increase in gold of \$579,579, and a decrease of silver of \$360,873. Nevada shows a falling off of \$6,666,093.

The explorations recently made of deep-sea bottoms show a novel constituent of such bottoms to be pumice dust, arising, it is presumed, from sub-marine volcanic action. So general is it, in fact, that it rarely fails to appear when carefully looked for in any of the dredgings, and it is believed to be the chief origin of the deep-sea clays. An additional element, which appears to have been detected at great depths, is "cosmic dust," or dust formed from aerolites. Another interesting point in these explorations is the finding of manganese peroxide in nodules inclosing organic remains—sharks' teeth and pieces of bone.

WAVES OF SAND.—Among the many important facts that were brought out by the United States survey of the great lakes and the Mississippi river, is the action of sand-waves in the Mississippi, at Helena, which in water from

thirteen to thirty feet deep are moving down the river at an average rate of eighteen feet a day. These sand-waves have an average length, measuring from crest to crest, of about 330 feet, an extreme length of about 500 feet and an average height of about five feet and an extreme height of about eight feet from valley to crest. The existence of sand-waves of such large dimensions, and moving with such velocity, does not seem to have been observed before on the Lower Mississippi.

The Hindoo thief's manner of scaling walls is very ingenious. It is by means of a huge lizard, which he carries with him in his nocturnal rambles. The process is as follows: The lizard, which is perhaps a yard in length, with great claws and flattened feet, and suction-powers like those of a fly, is made fast to the *dacoit* (the Hindostan name for a robber) by a tough cord tied to its tail. When the *dacoit* is pursued, and comes in his hasty flight to a wall, he quickly throws his lizard over it, holding fast to the other end of the cord. By means of its suction-powers the lizard fastens itself to the wall on the opposite side, and the thief draws himself to the top and jumps lightly down. By choking the lizard it is made to release its hold.

On a postal card on view at an exhibition in Germany there had been written in a German system of shorthand the large number of 33,000 words. Subsequently Mr. Hurst, of Sheffield, England, the publisher of *The Phonograph*, a shorthand magazine, offered prizes for miniature shorthand. The system was to be Pitman's, the writing to be legible to the naked eye, and to be on one side of an English postal card, which is considerably smaller than a German card—25,000 words on the former being reckoned equivalent to 33,000 on the latter. The first prize in this competition was awarded to G. H. Davidson, whose postal card contained 32,373 words, including the whole of Goldsmith's "She Stoops to Conquer," an essay on John Morley, and half of Holcroft's "Road to Ruin."

A HISTORIC TREE.—For the last three thousand years, it is said, there has stood in the immediate neighborhood of Sparta a gigantic cypress, the very same tree which of old found mention in the pages of Pausanias and other antique Greek historians. It reared its stately head to a height of one hundred and sixty feet above the ground, and its dark foliage overshadowed a space nearly three hundred feet in circumference. It was a source of profit, as well as of pride, to the inhabitants of Sparta, for its world-wide fame annually attracted hundreds of curious tourists from all parts of Eu-

rope, whose temporary sojourn in its vicinity brought no small amount of grist to the Spartan mill. Only the other day this venerable sylvan patriarch was ignited by a band of gypsies while cooking their midday meal under the shade of its leafy branches, and burned to the ground despite strenuous efforts made to save it from annihilation.

No truer lines were ever written than those of Horace Greeley:—"Fame is a vapor; popularity an accident; riches take wings; the only earthly certainty is oblivion." Five years ago the name of Gortschakoff was a familiar and brilliant one in history. To-day a decrepit, childish old man, totters about the streets of some dull Italian or South of France city, scarcely noticed, and quite unknown by most of the curious folk among whom he vegetates. A slow summer at Baden-Baden, a slower winter as we have written it, so perishes the career of a diplomat than whom there have been few, if any, shrewder or more successful. Forgotten in his own country, unknown in those to which his uselessness and his infirmities have exiled him, the great ex-Imperial Chancellor of all the Russias awaits the common fate of man in an obscurity as utter as he ever relegated any unfortunate conspirator against whose name he set the black marks to. Fate has its vengeance more complete than those of man.

FEMALE SOCIETY.—What is it that makes all those men who associate habitually with women superior to others who do not? What makes that woman who is accustomed to, and at ease in the society of men, superior to her sex in general? Solely because they are in the habit of free, graceful, continued conversations, with the other sex. Women in this way lose their frivolity, their faculties awaken, their delicacies and peculiarities unfold all their beauty and captivation in the spirit of intellectual rivalry. And the men lose their pedantic, rude, declamatory, or sullen manner. The coin of the understanding and the heart changes continually. Their asperities are rubbed off, their better materials polished and brightened, and their richness, like gold, is wrought into finer workmanship by the fingers of women than it ever could be by those of men. The iron and steel of their characters are hidden, like the character and armor of a giant, by studs and knots of gold and precious stones, when they are not wanted in actual warfare.

WITHIN a very near approach to the truth, the human family inhabiting the earth has been estimated at 1,000,000,000. Now, the weight of the animal matter of this immense body cast into the grave is no less than 534,000

tons, and its decomposition produces 6,000,000,000,000 cubic feet of matter. The vegetable productions of the earth clear away from the earth the gases thus generated, decomposing and assimilating them for their own increase. This circle of changes has been going on ever since man became an occupier of the earth. He feeds on the lower animals and on the seeds of plants, which in due time become a part of himself. The lower animals feed upon the herbs and grasses, which in their turn become the animal; then, by its death, again pass into the atmosphere, and are ready once more to be assimilated by plants, the earth or bone-substance alone remaining where it is deposited.

HOURS AND MINUTES.—Why is our hour divided into sixty minutes? Why not divide our time as we do our money, by tens, counting ten, or fifty, or hundred minutes to the hour? This question was asked by an intelligent boy a few days since, and the answer given him may both interest and instruct other young people. The answer is this: We have sixty divisions on the dials of our clocks and watches, because the old Greek astronomer, Hipparchus, who lived in the second century before Christ, accepted the Babylonian system of reckoning time, that system being sexagesimal. The Babylonians were acquainted with the decimal system, but for common and practical purposes they counted by *sossi and sari*, the *sossoi* representing sixty, and the *saros* sixty times sixty, 3,600. From Hipparchus, that mode of reckoning found its way into the works of Ptolemy, about 120 A. D., and thence was carried down the stream of science and civilization, and found its way to the dial-plates of our clocks and watches.

LIMITATION OF THE MIND.—"Does this reasoning prove there is no God?" Not at all. It simply proves that the finite mind is utterly impotent to apprehend God. It proves that we do not and can not comprehend primary causations; that our perceptive faculties are so limited by the nature of their constitution that they can not apprehend the primary nature of the simplest natural law; and if we can not comprehend the nature of the force called gravity, or heat as a mode of motion, except as physical facts, how can we have any rational conception of any of those qualities of mind that produced these laws? If the rude savage, after examining a complicated piece of machinery, can form no just conception of the forces that impel it, or even of the purpose it serves, how much less can he understand the peculiar qualities of mind that invented and produced it. If by the deepest research we can not analyze the subtle law that connects the mole-

cular movement of the brain with thought, how can we analyze the thoughts of an infinite mind of which this law was but a thought? Is it not plain that, in attempting this, we attempt the impossible?

SUNLIGHT A NECESSITY.—Sun-baths cost nothing, and are the most refreshing, life-giving baths that one can take, whether sick or well. Every housekeeper knows the necessity of giving her woollens the benefit of the sun, from time to time, and especially after a long rainy season, or a long absence of the sun. Many will think of the injury their clothes are liable to, from dampness, who will never reflect that an occasional exposure of their own bodies to the sunlight is equally necessary to their health. The sun-baths cost nothing, and that is a misfortune, for people are still deluded with the idea that those things only can be good or useful which cost money. Let it not be forgotten that three of God's most beneficent gifts to man—three things the most necessary to health—sunlight, fresh air, and water, are free to all; you can have them in abundance, without money and without price, if you will. If you would enjoy good health, then, see to it that you are supplied with pure air to breathe all the time; that you bathe for an hour or so in the sunlight, and that you quench your thirst with no other fluid than water.

THE EARLY SYSTEM OF ASTRONOMY.—From the examination of a book compiled 2,000 years B. C. it has been ascertained, what has long been supposed, that Chaldea was the parent land of astronomy; for it is found, from this compilation and from other bricks, that the Babylonians catalogued the stars, and distinguished and named the constellations. They observed the seventh day as a day of rest. They invented the sundial to mark the movements of the heavenly bodies, the water-clock to measure time, and they speak in this work of the spots on the sun, a fact they could have known only by the aid of telescopes, which it is supposed they possessed, from observations they have noted down of the rising of Venus, and the fact that Layard found a crystal lens in the ruins of Nineveh. These "bricks" contain an account of the deluge, substantially the same as the narrative in the Bible. They disclose that houses and lands were then sold, leased, and mortgaged; that money was loaned at interest; and that the market gardeners, to use an American phrase, "worked on shares"; that the farmer, when plowing with his oxen, beguiled his labor with homely songs, two of which have been found, and connect this very remote civilization with the usages of our own times.

A FRESH WATER SPRING IN THE ATLANTIC.—One of the most remarkable displays of Nature may be seen on the Atlantic coast, eighteen miles south of St. Augustine. Off Matanzas Inlet, and three miles from shore, a mammoth fresh-water spring gurgles up from the depth of the ocean with such force and volume as to attract the attention of all who come in its immediate vicinity. This fountain is large, bold, and turbulent. It is noticeable to fishermen and others passing in small boats along near the shore. For many years this wonderful and mysterious freak of Nature has been known to the people of St. Augustine and those living along the shore, and some of the superstitious ones have been taught to regard it with a kind of reverential awe, or holy horror, as the abode of supernatural influences. When the waters of the ocean in its vicinity are otherwise calm and tranquil, the upheaving and troubled appearance of the water shows unmistakable evidences of internal commotions. An area of about half an acre shows this troubled appearance,—something similar to the boiling of a washer-woman's kettle. Six or eight years ago Commodore Hitchcock, of the United States Coast Survey, was passing this place, and his attention was directed to the spring by the upheavings of the water, which threw his ship from her course as she entered the spring. His curiosity becoming excited by this circumstance, he set to work to examine its surroundings, and found six fathoms of water everywhere in the vicinity, while the spring itself was almost fathomless.

EFFECT OF SUNSHINE.—From an acorn, weighing a few grains, a tree will grow for 100 years or more, not only throwing off many pounds of leaves every year, but itself weighing several tons. If an orange twig is put in a large box of earth, and that earth is weighed when the twig becomes a tree, bearing lucious fruit, there will be very nearly the same amount of earth. From careful experiments made by different scientific men, it is an ascertained fact that a very large part of the growth of a tree is derived from the sun, from the air, and from the water, and a very little from the earth; and notably all vegetation becomes sickly unless it is frequently exposed to sunshine. Wood and coal are but condensed sunshine, which contains three important elements equally essential to both vegetation and animal life—magnesia, lime, and iron. It is the iron of the blood which gives it its sparkling red color and its strength. It is the lime in the bones which gives them the durability necessary to bodily vigor, while the magnesia is important to all of the tissues. Thus it is, that the more

persons are out of doors the more healthy and vigorous they are, and the longer will they live. Every human being ought to have an hour or two of sunshine at noon in winter and in the early forenoon in summer.

A WONDERFUL LAKE IN IOWA.—The greatest wonder in the State of Iowa, and perhaps in any other State, is what is called the Walled Lake, in Wright County, twelve miles north of the Dubuque and Pacific Railway, and 150 miles west of Dubuque City. The lake is two or three feet higher than the earth's surface. In some places the wall is ten feet high, fifteen feet wide at the bottom, and five feet wide on the top. Another fact is the size of the stones used in the construction, the whole of them varying in weight from three tons down to 100 pounds. There is an abundance of stones in Wright County, but surrounding the lake, to the extent of five or ten miles, there are none. No one can form an idea of the means employed to bring them to the spot, or who constructed it. Around the entire lake is a belt of woodland half a mile in length, composed of oak. With this exception, the country is a rolling prairie. The trees must have been planted there at the time of the building of the wall. In the spring of the year 1856 there was a great storm, and the ice on the lake broke the wall in several places, and the farmers in the vicinity were obliged to repair the damages to prevent inundation. The lake occupies a ground surface of 2,800 acres; depth of water as great as 25 feet. The water is clear and cold, soil sandy and loamy. It is singular that no one has been able to ascertain where the water comes from nor where it goes, yet it is always clear and fresh.

THE CHANGES IN THE FROG.—Nowhere in the animal kingdom is there so favorable an opportunity for peeping into Nature's workshop as in the metamorphoses of the frog. This animal is a worm when it comes from the egg, and remains so the first four days of its life, having neither eyes nor ears, nostrils, nor respiratory organs. It crawls, and it breathes through its skin. After a while a neck is grooved into the flesh, and its soft lips are hardened into a horny beak. The different organs, one after another, bud out; then a pair of branching gills; and last, a long and limber tail. The worm has become a fish. Three or four days more elapse, and the gills sink back into the body, while in their place others come much more complex, arranged in vascular tufts, 112 in each,—yet they, too, have their day, and are absorbed, together with their

framework of bone and cartilage, to be succeeded by an entirely different breathing apparatus, the initial of a second correlated group of radical changes. Lungs are developed, the mouth widened, the horny beak converted into rows of teeth, the stomach and the intestines prepared for the reception of animal food instead of vegetable. Four limbs, fully equipped with hip and shoulder bones, with nerves and bloodvessels, push out through the skin, while the tail, being now supplanted by them as a means of locomotion, is carried away piecemeal by the absorbents, and the animal passes the rest of its life as an air-breathing and a flesh-feeding batrachian.

FORMS OF LIGHTNING.—A flash of lightning is a very large spark of electricity,—just the same thing that one sees given by an electric machine in a lecture on Natural Philosophy, the only difference being that the best machine will not give a spark more than a yard long, while some flashes of lightning have been estimated to be several miles in length. According to their appearance, various names have been given to these sparks in the sky, though in reality all the several kinds are one and the same thing. On a warm summer evening one often sees the clouds on the horizon lit up with brilliant glows of lightning, unaccompanied by any sound of thunder. To this appearance the name of "heat-lightning" has been given, and the warm weather is often assigned as its cause. In point of fact, the heat-lightning is only that of a thunder-shower so far off that, while the observer can see the flash, no sound of thunder reaches him, and the intervening clouds veil and reflect the flash until it becomes a glow, instead of the sharp streak usually seen. Where the flash, starting from one point, branches out and divides into several parts, it has received the name of "forked lightning." This is usually seen when the discharge is near the observer. Single flashes bearing a zigzag or crinkled aspect are denominated "chain-lightning," probably from their resemblance to a chain thrown loosely on the ground. Again, when several discharges occur from about the same place at the same time, and are screened by rain or clouds so as to light up the heavens with a broad bright glow, the title of "sheet-lightning" is applied. These four comprise all the common forms. There is, however, one rare manifestation, called "ball-lightning." In this phenomenon a small globe or ball of apparent fire rolls slowly along the ground, and after a time suddenly explodes, scattering destruction around. There are few instances of this on and record, no very satisfactory explanation has ever accounted for this curious appearance.

DR. HAZARD ON MATERIALISM.—No. 2.

St. LOUIS, Dec. 28, 1880.

A. WILFORD HALL.

Dear Sir: I was greatly pleased to receive your very kind and candid letter of the 20th inst., for which please accept my thanks. I should have replied before now, had not pressing engagements interfered with my perusal of your book. Even now I have not been able to read it as thoroughly as I had intended: hence my reply will have to be devoted more to your letter than to many points in the "Problem" which are certainly assailable.

First: Regarding the *prejudice* which you see in my frank expression of my impressions derived from a reading of several chapters in the former edition. I presumed, and am still unconvinced to the contrary, that the same line of argument is pursued in both editions. As I considered the basis to be fallacious, it is easy to see *why* I feared we could come to no agreement.

Second: I can not form a mental concept of a *substance* that is not *material*. It seems to me as delightfully absurd as an impossible possibility, or any open contradiction in terms. If not a paradox what is it? You now see how I came to take you for a most ultra materialist. Of course, if substance and material are two distinct things, I must be hopelessly in the darkness; for, to me, the distinction is inconceivable.

I admit that this inability on my part may be a sign of mental incapacity. Nevertheless, it exists, and may as well be taken into account in our discussion. What I term *force* (that which is capable of changing the position of matter, whether it be a planet or a molecule), you consider a substance,—which is, at the same time, not substance. As I read your words, it is a hypothetical thing which can be created out of nothing at will, by an effort of a man or an insect; and after a longer or shorter duration again becomes nothing (example, sound). In what way this remarkable theory of sound helps any one to a belief in human immortality, is, I confess, to me, incomprehensible.

The "materialism" of Darwin, Spencer, &c., as I understand it, teaches absolutely nothing relative to the soul of man,—neither affirms nor denies its existence, and does not meddle with the question of immortality. I am sure that many so-called materialists are earnest believers, like myself, in one true God. They also believe Holy Writ to the effect that He is not to be found out by men. They make no pretensions to having been admitted into His councils; and have such absolute faith in Him that they are willing to leave all that is beyond

our feeble sight in His hands, without reservation. You see I am a sort of Unitarian, with Darwinian leanings.

Third: Regarding the action of the water-wheel, which you so kindly explain to me,—or, rather, make use of to explain your conception of the substantial nature of force as contradistinguished from motion,—I must again beg leave to indicate the dissonance of our views. To me, the motion of the wheel expresses only a part of the motion of the water that falls upon it because of its weight; hence is merely a translation of gravity in terms of mechanical motion. If the turning of the wheel is motion, and the falling of the water is motion, is it not logical to consider the gravity, by virtue of which both phenomena are produced, to be merely another mode of motion? We have no knowledge of gravitation except as it produces mechanical effects, and every variety of force may be derived from it. But of course you must be perfectly familiar with all the arguments which tend to prove the persistence and equivalence of forces, and it would be out of place for me to enumerate them. They are none of them known to us except through their effects upon matter. If they were "substances" in any conceivable sense of the word, would they not be capable of independently manifesting themselves? That they are "substantive," that is to say, capable of existence entirely unconnected with matter, seems to me to be as violent an assumption as that of the existence of a fourth dimension in space. Calculations may be based upon the latter, and theories formulated upon the former hypothesis, but *cui bono*?

Fourth: You infer, very hastily it appears to me, that because steam (a material) moves the piston of an engine, that *therefore* the magnetism that moves a bit of iron must be a substance, "though not a material or corporeal substance," and indicate that I would be very illogical not to admit your conclusion! Your syllogism proves too much, it appears to me; and I am willing to leave it to a college of logicians to say which is right. If it proves anything, it proves that instead of being an immaterial *substance*, magnetism is in very fact a *material* body having dimensions and weight. Thus, anything that moves matter (like steam) is a *material* substance. Magnetism is capable of moving matter, that is, iron, nickel, steel. Therefore magnetism must be a *material* substance, and *not* an incorporeal, non-material substance! Of course, I, as well as you, recognize the fallacy of *this* argument; but you will not so easily recognize the same kind of error in other of your propositions.

I must say that your conception of a *sub-*

stance, in some regards comparable to light or electricity, composing the body of God and the souls of men, seems to me, as I expressed it in my brief review, as "out-Heroding" the Herods of materialism. For my own part, I am unable to formulate my conception of the Deity before whom I bow. I can not conceive of Him as an overgrown man occupying a corner of His universe, moved by human passions and capable of change. I can think a little of what He is *not*; but I dare not, even in my own mind, formulate anything as His likeness.

I have again examined many of your arguments against the "wave-theory," and find them based upon manifest misconceptions. I have Tyndall's work on "Sound," and think that in many cases you have not understood him. I also regard your corpuscular theory as to the last degree untenable. If you are able to make Tyndall and Helmholtz ridiculous, I believe it would be easy enough to "pay you back in your own coin."

Again expressing my sincere thanks for the very kind letters you have favored me with, and hoping that I may be excused from criticising your book as I honestly think it deserves, I will close this already too long letter. I am sorry you did not state whether you had ever *personally* examined the "double siren." It is very possible that such an examination would convince you of the truth of the "interference" theory.

I remain very respectfully yours,

WM. B. HAZARD.

REPLY.

26 EAST NINTH STREET, }
NEW YORK, Jan. 5, 1881. }

DEAR DR. HAZARD.

I am in receipt of your second letter, in reply to mine of the 20th ult. I beg your pardon for not answering immediately; but the extended personal correspondence growing out of our tremendous sales of *The Problem of Human Life* overwhelms me with work.

Allow me to congratulate you upon having entered into this discussion of the intricate questions involved, with such a hearty good will and evident desire for the truth. You may rest assured that I will aid you to the extent of my ability; and it is my conviction that there is no real necessity for a variance in opinion between us upon any essential point discussed in these letters, especially after having agreed upon the cardinal proposition of the existence of "an all-knowing, almighty God"; and after further agreeing, as I judge we do by your present letter, that man is destined for a conscious existence after death.

It often occurs, even in the heat of a written

discussion, that we imagine essential differences to exist, and then unintentionally magnify them into absolute barriers, when, by a careful selection of words, a proper regard for their definitions, and a liberal spirit of fairness for the truth's sake, we might find that no irreconcilable difference really exists. I believe now, if you will carefully re-examine your arguments in the light of the criticisms I am about to offer, you will agree with me that this statement fairly meets our case.

One of our principal sources of difference now appears to be in not arriving at a proper understanding of the true meaning of the two words *substance* and *material*. Let us see if we can not settle this preliminary question, and thereby get rid of our main source of trouble. You say you "can not form a mental concept of a *substance* that is not *material*," and that you regard any "distinction" between the two as paradoxical, or an open "contradiction in terms." Now this, as you certainly will admit, depends entirely upon the definition you attach to the words *substance* and *material*. Am I not right? You assume a certain definition as absolutely the correct one, and hence the failure of your "mental concept." With my definition, however, that *material* signifies the physically tangible forms of *substance*, thus allowing of the existence of other forms or grades of substance finer than material,—all difficulty in our arriving at an understanding would seem to be at an end. Even in this material or tangible department of substance there are numerous and self-evident grades of density and tenuity, as you are compelled to admit, from *platinum*, the heaviest known substance, up to *odor*, which is admitted to be substance by the whole scientific world. Yet this latter substance is so nearly intangible that but for the olfactory nerve (of which many are entirely deprived) no scientific test could prove its existence, as I show in *The Problem of Human Life*. Notwithstanding this state of facts, you fail to pay the slightest attention to this marvelous transition from density to rarity in the material world, or otherwise you might have caught a glimpse of a new world of substantial entities entirely beyond the limits of material conditions. It would appear that the instructive lesson taught by our atmosphere, so removed from the gross conditions of solid bodies though still a substance in the material sense, has not yet made its due impression upon your mind. Had you intelligently studied the demonstrable gradations all around you in material substances, you would have long since suspected, at least, that other substances of an immaterial nature, but as real as our atmosphere, might exist in ten thousand forms entirely above material condi-

tions. But you have lost the benefits of this beautiful lesson in Nature by the arbitrary definition you have seen fit to give to the words *substance* and *material*, making them absolutely synonymous terms, and thus shaping even your first materialistic criticism of my book in *The Clinical Record*, charging me with being equally a materialist with Haeckel and Spencer. Your remark in your present letter, with reference to that criticism is directly to the point. You say: "You now see how I came to take you for a most ultra materialist." Yes, Doctor, I do see very clearly just how you came to fall into such a ridiculous error. It was by this very misconception of the proper definition of the words in debate. As a proof, notice this sentence from your present letter: "Of course, if *substance* and *material* are two distinct things [?] I must be hopelessly in darkness, for to me the distinction is inconceivable." This is a clear, but no doubt an unintentional, misrepresentation of the views you are opposing. What man ever thought of making them "two distinct things," or for a moment doubting that *material* bodies were really and truly *substance*? Did you candidly think that I denied the substantial nature of *material* things, because I believed in other substances higher than *material*? If so, I will forgive you. Let me illustrate the true difference between *substance* and *material*, and thus try to relieve your evident mental tenebrosity upon this point.

You certainly can form a mental concept of the fact that all *wire* is *metal*, while at the same time recognizing the fact that all *metal* is not *wire*, can you not? The greater (*metal*) includes the lesser (*wire*), but this does not make them synonyms, as you have done with *substance* and *material*. While all *wire* is *metal*, surely you would not teach that therefore all *metal* must be *wire*! While all *material* is *substance*, it is a very different thing to assume that all *substance* is *material*. If such a distinction as this is still "inconceivable" to you, then I despair of the effect of my argument, and will have to content myself to let you continue "hopelessly in darkness," for I will feel as if I were fighting "like one that beateth the air."

Consistently in keeping with this simple explanation, as shown in my former letter to you, it was proved that even the immaterial forces, such as magnetism and life, which move physical and ponderable bodies, must be substantial or else they are positively *nothing*, and could not by any possibility produce such physical results. That argument so clearly showing the substantial nature of magnetism, as elaborately urged on pages 38 to 40 of *The Problem of Human Life*, you do not attempt to

meet, for the reason, allow me to believe, it admits of no kind of reply. You call magnetism a *force*, to distinguish it from substance. But this is a-begging of the question. I assume and try to show that all force is but a refined form of substance, or it could not produce a recognized substantial and even physical result, like moving a body of iron.

You seem to be very cautious not to concede anything of which you "can not form a mental concept." I must confess that this caution on your part is more to be commended than your consistency; for while it is beyond the grasp of your mental powers that force can be substantial, you can easily conceive of a force (which is absolutely nothing, not being substance,) moving a physical body. Yes, you can readily form a "mental concept" of this *nothing* (magnetism) taking hold of a solid mass of iron and lifting it from the ground in opposition to another *nothing* (gravitation) which tries to hold it down! I do not think you treat your "mental concept" fairly, or you would not so readily conceive of the lifting of *something* out of its place by *nothing*, under the accommodating name of *force*. You can conceive of a so-called force within us, termed *life* or *soul*, moving our molecules, and bioplasts, but your caution prevents your conception of such force as substantial because it does not come under the arbitrary definition of *material* which you have adopted as embracing all the substances there are in the universe. Or, in other words, you can not conceive of life or soul as substantial because you cannot see, handle, or otherwise recognize it by your senses as you do gross, material objects. Yet you can conceive, with Prof. Haeckel, this life-force which *moves* our molecules as the very *motion* thus produced. You are thus enabled, by the almost incredible flexibility of your powers of conception, to look upon a *motion* as the absolute *cause of itself*, but you can not form a "mental concept" of the force which causes such motion as anything except the motion which it causes! But further: you can, as you admit in your first letter, conceive of an invisible, intangible, "all-knowing, almighty God," and consequently you have no trouble in "forming a mental concept" of the fact that He is capable of thinking, seeing, hearing, acting, creating, &c. But instantly your caution steps in, and you become involved "hopelessly in darkness" in attempting to conceive of Him as a personal being located in one part of the universe, but with substantial attributes extending "through all extent." My powers of conception, as I trust also my consistency, is the very reverse of yours. When I am able to conceive, as you do, of the existence of an "all-knowing, almighty God,"

I am forced to regard Him as a person, because all my experience is in that direction. I can not begin to conceive of a being capable of thinking, seeing, hearing, feeling, working, unless He possesses the actual personality and faculties which we know to be necessary for such mental and physical acts on our own part. But as we can, through our faculties and senses, take cognizance of many events and objects at a distance and entirely separated from our personal being, I have no difficulty in conceiving (though not comprehending) the possible existence of a personal being of infinite capabilities and attributes, who could see, and hear, and know, and feel, and operate throughout immensity of space, as readily as we poor finite mortals can recognize by our senses what is taking place a hundred feet away. If our human faculties were multiplied a million times in extent and power (which I can conceive, since we know they can be increased many fold), I could readily conceive of the possibility of a governor of a State sitting in his gubernatorial chair and passing under personal observation and supervision every event occurring throughout the entire State, as fully as he now observes and supervises what is going on among his clerks and assistants right in his own office. So if his faculties and powers were infinitely augmented, I have no difficulty in conceiving of his mental and substantial presence extending through infinite space, even though he might occupy a definite location as to his personal ego or self. I beg of you, Doctor, to give your powers of mental conception a fair show, and I doubt not, by the time you reply to this letter, there will be no difference between us worth discussing.

Having thus come to a fair basis for an understanding upon the only important difference between us, I propose now to pay my respects to a few minor points in your letter. I am glad to see that you have squarely given up the position that *force* and *motion* are one and the same. This is a decided advance since your previous letter; for in that you used the two terms interchangeably. But you now define your position as follows: "What I term *force* (that which is capable of changing the position of matter, whether it be a planet or a molecule,) you consider a substance," &c. This is good. Allow me to congratulate you and the future status of *The Clinical Record*. If *force* is "that which is capable of changing the position of matter," then it cannot be the *motion* of the matter thus changing position. If life-force is that which *moves* the molecules of our bodies, then surely the *motion* of these molecules, thus caused, is not life, and Prof. Haeckel's materialistic definition of life, or soul, as but a mole-

cular mode of motion, receives its quietus at the hand of one of its friends. Now, since you admit that *force* is not the motion of a physical body, but rather that which *causes* its motion, I leave you seriously to reflect till your next letter is written whether you had not better come entirely over to my position, and agree that all *force* is substantial, rather than continue to contend that this *synonym of nothing* is capable of producing mechanical results by changing the position of matter.

But having taken the position here charged, that *force* is *nothing*, though it produces physical results, you seem to wish to involve me in the same absurdity. To prove this, I will continue the last quotation from your letter: "What I term *force* . . . you consider a *substance*, which is at the same time *not a substance*. As I read your words it is a *hypothetic thing* which can be created out of *nothing*, at will, by the effort of a man or an insect; and after a longer or shorter duration *again becomes nothing* (example, sound)."

Well, I must confess this caps the climax of inexcusable misconception. How you could have so drawn upon your imagination as to charge me with this batch of utter absurdities, it is impossible for me to guess, unless it was a desperate effort to make my position as ridiculous as your own, on the ground that misery loves company. The truth is, your charge is totally without foundation, though I can not believe that you intended to fabricate it. Look at your language: "*As I read your words*," &c. Now I am obliged to say, you have never read my words at all, or you would have known that I teach, throughout the book, exactly the opposite of what you attribute to me. Can it be possible that the conductor of a leading scientific journal, claiming to represent the advanced thought of the time, will presume to criticise a book which is prominently before the public, charging the author with materialism, while absolutely *guessing* at what he teaches? You have done so in the present case, and unfortunately have succeeded in guessing the exact opposite of what I do teach. Lest you never will read the book, at least understandingly, I will quote my very words from the second chapter, p. 40, of *The Problem of Human Life*, to convince you how little attention you are paying to my most prominent positions and arguments:—

"After the magnetism is once admitted to be a substance, which it must be, it matters not how tenuous or intangible, *its destruction is impossible*; for it is one of the best-established principles of science that *no substance in the universe can be annihilated*. The very doctrine of the *conservation of force* proves this. Magnetic substance may become so diffused through

space as to cease to manifest itself to our senses, or lack the concentration necessary to move physical bodies, but *not a particle of it is lost*. This is beautifully illustrated by odor. . . .

A fair-minded materialist will freely admit that these odorous particles can never cease to exist, however widely diffused through space; and it is certain that the Author of Nature could, did it so please Him, and by a law of His own ordaining, instantly collect into a single pellet all the odorous particles that ever issued from the flower-gardens of earth, or all the scattered corpuscles of magnetism that ever radiated from magnetic poles,—just as He can, and I believe will, ultimately gather unto Himself *every scattered corpuscle of our vital and mental entities* through the guardian power which numbers even the hairs of our heads."

Now I ask you, Doctor, if this extract looks anything like the bald misstatement of my views in your letter? I hold the same position with reference to sound, light, heat, electricity, and gravitation. Not a particle of either can ever be lost in God's universe. Substances can change form, and be diffused beyond recognition; but their annihilation, or change to "*nothing*," as you accuse me of teaching, is impossible.

You say you fail to comprehend in what way I propose to help a belief in human immortality by introducing and maintaining the substantial nature of sound. That, again, is the fault of your comprehension, and not of my book, for in the preface to the first edition it is distinctly explained.

Your explanation of the manner in which water acts upon a wheel, to cause it to turn, is partly correct. The water is the contact or immediate cause or force which moves the wheel, while gravity is the primary force which moves the water. But with this much self-evident truth, you unfortunately fall into the old fallacious rut of Tyndall and Haeckel, and end with gravity as "*merely another mode of motion*." But "motion" of what? In order to have *motion* you must have something substantial to *move*. You can not resort to the undulatory theory, as in sound, and say that gravity acts, in bringing the water down, by means of *air-waves*; for water will fall the same in a vacuum! You can not help out this "mode of motion" by *etheral* undulations, as Tyndall does in explaining *light* and *heat*; for then you would be compelled to postulate a real substance (ether) which is not material, since it acts in defiance of all matter, circulating freely in the body of the diamond, as all modern scientists aver. How, then, are you going to make gravity "*merely another mode of motion*" without anything to move, since gravity is not a substance? Ah! you say, that is plain. The *water* is the substance that moves, and that explains how gravity is a mode of motion! But stop. Grav-

ity is *that which moves the water*, and hence it is the cause of the water's motion. You can not make gravity both the *motion* and its *cause*—both the *cause* and the *effect*! How much simpler to make gravity an immaterial substance, to start with, as I do, and then you have something to be moved. I am sure you will be glad to come to my view yet, as the only rational and consistent theory for explaining the forces of Nature.

Let me here quote your words in regard to the manner in which gravity moves the water and the wheel, and then re-quote and apply them to the piston of the steam-engine, and see where it leaves your argument. You say:—

"If the *turning* of the wheel is *motion*, and the *falling* of the water is *motion*, is it not logical to consider the *gravity*, by virtue of which both phenomena are produced, to be merely another mode of motion?"

Your meaning cannot be misunderstood. But now witness the *reductio ad absurdum* of you "logical" conclusion, and in your own words:

"If the turning of a steamboat-wheel is *motion*, and the travel of the piston is *motion*, is it not logical to consider the *steam*, by virtue of which both phenomena are produced, to be merely another mode of motion?"

Consequently your "logical" course of reasoning proves *steam* not to be substantial! Or, to bring it more within the scope of your "mental concept":—

"If the oscillation of the pendulum is *motion*, and the turning of the clock-wheels is *motion*, is it not logical to consider the *steel spring*, by virtue of which both phenomena are produced, to be merely another mode of motion?"

Hence, the *spring* can not be substantial! Shade of Watts, deliver us from such "logic"!

We thus come back to the one sure and common-sense view of this subject, as urged in my previous letter, which all the logic of the schools can not shake, namely, that the magnetic force which moves the armature, the force of gravity which moves the falling water, and the life-force which moves the molecules and organs of our bodies, are as really substantial as are the *steam* which moves the piston and the *spring* which moves the clock. As it is impossible to form a mental concept of the *steam* and *spring* except as substance, it broadly, at once and forever solves the problem of the nature of all force, making it worse than folly—nay, madness,—for you to fight against it any longer. Allow me then, Doctor, to say frankly, and in all kindness, that you owe it to me, no less than to yourself, to make a public apology through the columns of *The Clinical Record* for the original and mistaken charge of gross materialism which you have made against *The Problem of Human Life*.

A remark or two more, and I will conclude. You think I do not understand Tyndall's book on *Sound*. Will you be so kind as to point out wherein I misconceive him, that I may have an opportunity to acknowledge my error? But judging from the way you read and understand my book, your opinion gives me very little alarm at the possibility of my having misconstrued that great scientist. You further express your opinion that my corpuscular theory is "to the last degree untenable." This is very easily said. A child could say as much. But it is a very different thing to substantiate it; and I doubt very seriously if you feel like undertaking the task in such a manner as to let the public judge of your success or failure. We will see. You also think if I am able to "make Tyndall and Helmholtz ridiculous," I could be easily paid back in my own coin. How would it do for you to assume the responsibility, and commence at once to draw on your bank account, since neither Tyndall, Helmholtz, nor Mayer seems willing to undertake the liquidation of the indebtedness. You ask me, the second time, if I had ever personally examined the double siren, to know if my explanation of it were correct. In my other letter I did not think it necessary to answer this question, as you proposed to read the argument carefully, for I state distinctly, on page 295, that I have never seen that instrument. It was not necessary to see it, with such accurate engravings of it as appear in the *Sensations of Tone*, by Prof. Helmholtz, in order to understand its operation and effect. Leverrier did not need to see the planet Neptune before pointing out its position and motion.

Finally, you express a hope that I will excuse you from criticising my book as you honestly think it deserves! I will do nothing of the kind. You are at perfect liberty to carry out the covert menace implied in this request. But I beg of you not to lose sight of the fact that for every idle word you write more than fifty thousand intelligent readers of *The Problem of Human Life*, as well as its author, will hold you to a rigid account.

With the utmost respect, I am, yours, &c.,

A. WILFORD HALL.

SCIENTIFIC PARROTS,

BY REV. W. K. BOYLE.

THERE is often an unfortunate tendency in our schools to prevent original thinking and research. A Professor who gets his knowledge at second-hand, and who believes in the infallibility of the sources whence he has drawn his

learning, impresses on his students his own faith; and so very authoritatively crushes any objector in the lecture-room as to excite the ridicule of his fellows, and prevents him from being guilty of the temerity of doubting received facts again. And the student learns to take his milk through a tube with scarcely an effort. And now to quote Darwin, Huxley, Tyndall, Helmholtz, Haeckel, or our own Mayer, settles finally any objection. All this is utterly wrong. Mind is not to be used to absorb truth only. Memory may be so cultivated as well-nigh to paralyze mind. Concentrated food may scientifically represent all the elements I can find in my ordinary diet, and yet I must do my own chewing and digesting, or I can not be a healthy man.

I like a good honest doubter. I know he may not for a time be as happy as one of your negative people, who are willing you should feed them with a spoon; but when such a doubter gets down to the solid rock of truth, and becomes satisfied he has really settled a vexed question, the joy he has is so deep and all-pervading that a moment of it is worth the sum of all the other gets. Let us accept no truth as final unless it is clearly enunciated in God's Word, or until our own reason cries out its glad Eureka.

The scientific parrots are keeping the world back. They are breaks on the car of progress. They simply repeat their masters; and therefore often spread errors, and teach others to accept without examination the announcements of men who have won renown. The geologists have held for years that certain forms of life perished ages ago, and each student repeats the assertion, and yet the dredges of the "Challenger" brought up some of the same forms alive from the depths of the sea. They have steadily held to the enormous antiquity of man, and the stone age, and the Swiss lake-dwellings, and the Scandinavian kitchen-heaps, and various cave-deposits, &c., have all been used to prove their assertions; and many a fledgling fresh from College shocks the old folks at home by declaring that he don't believe the Bible, because science teaches that man has lived for hundreds of thousands of years. And the young fool only repeats his Professor. And so it went until Southall published "The Recent Origin of Man," a book none have dared to attack; and now the scientists admit they may have blundered.

The wave-theory of light and sound and heat obtained currency everywhere because certain great names indorsed and elaborated it, and none were found to scrutinize it closely until Wilford exploded his bomb in their camp. It is very cheap for them to ignore him now; but

they must answer him, or confess by their silence their inability to do so. But the parrots will prate of wave-theory, and talk of Evolution still, although Darwin has been successfully questioned, and Haeckel has been proven inconsistent and insincere, and at many points in utter error.

It was formerly taught by chemists that oxygen was the universal acidifying principle; and every parrot repeated this until some original thinker and investigator proved that hydrogen was necessary to develop activity in latent acids. Chemists held that there were about seventy elements; and every amateur only repeated the lesson, until a prominent spectroscopist gives us reason to believe that the elements may be only a few, perhaps only seven,—a striking uniformity in sounds, colors and elements, and these groups of sevens may perhaps only be forms of one, emanating from The One.

Now, then, we insist on careful scrutiny of each scientific theory, for the facts are comparatively few. We maintain that induction shall be carefully made, and frequently tested. We insist that men be taught to think for themselves. We affirm that men can not read God's Book in Nature without mistakes until color-blindness be cured, and men agree in their classifications; and that even then the Book of Nature shall not be the authoritative interpreter of the Revealed Word.

A parrot is often a bird of beautiful plumage, and may be so taught as to excite our wonder; but after all it is only a dirty bird, a useless bird, an ungainly bird. I propose a new classification for educated men; and as the last and least of all let us place the "educated parrot."

CONSCIOUS EXISTENCE, LIFE, AND IMMORTALITY.

BY C. S. TOWNE.

THE studies of twenty years have resulted in discoveries touching conscious existence, life, and immortality, which, so far as I know, have never before been spoken or written. Whoever gives attention to the statements of any writer upon the immortality of the soul will almost invariably see that the three terms of the heading to this article are used interchangeably. I am satisfied that there are such radical and essential differences between these terms that they can never be used one for another. To the thinking mind it must be evident that the universe is composed of entities and the states or conditions in which they exist. Eternal time and infinite space are the two states wholly

unchangeable in their nature, having no conceivable opposites. All entities have their expansion of form located in space,—their continuation of existence measured by time. Space is their state of expansion,—time their state of continuance.

If there were but one homogeneous entity in existence, space and time would be its only states or conditions. But observation shows an uncounted variety of entities in the universe, reducible to three divisions, namely, chemical compounds, organs, and powers. Chemical compounds are of many kinds and forms; organs are of fewer kinds, variously complex in structure; but powers are of two kinds only, soul and spirit. Chemical compounds and organs may be reduced alike to ultimate atoms indefinitely dispersed; soul and spirit cannot be. Hence, the universe is constituted of three substances, namely, matter, soul and spirit, having inherent and ineradicable differences of nature and property. The prime property of material substance is inertia, or the impossibility of moving. The prime property of psychical substance is the power to will and execute motion. The prime property of spiritual substance is to guide motion. The ultimate natures of these substances are wholly incomprehensible. Soul and spirit can not be simply extended attenuations of material substance; for if they were, matter soul and spirit might be reduced to homogeneity, and then all the states I am about to enumerate would disappear, leaving only space and time. The form of the psychical entity is one and unchangeable, the "human form divine,"—divine, because it is the image of the divine Form. The spiritual entity is capable of assuming any form, indefinitely expanding or intensely condensing. The forms of material entities are subject to the will and guidance of the psychical and spiritual entities.

The following are some of the states which obtain by reason of the ineradicable differences between material, psychical, and spiritual substances, and their mutual interdependence. In the highest class, embracing man, we have life, and its opposite, death,—mortality and immortality, truth and error, truth and falsehood, right and wrong, &c. In the second class, embracing vegetable and animal organisms, we have life and death. In the third and lowest class, embracing inorganic nature, we have life only and the positive and negative poles of electric and magnetic action.

In the manifestation of life there are many forms. 1. The life of God. 2. Below Him we have human physical life, spiritual life, psychical life, personal life, and the faith-life. 3. Below man we have animal and vegetable life. 4. Below these we have ultimate or atomic

life. But the grand requisition yet remains, to define the state or condition called life, with its opposite, death. Here is where all respondents have failed. The definition here must be one that will embrace both God and the universe, and fully satisfy every demand, every exigency, and every case. I answer, then, that life is a state of union; death, a state of separation. But, a union of what? and with what? I answer that in the life of God, life is the eternal union of the three essential substances—matter, soul, and spirit, in one Person, one divine Form. Below the divine Being, and following the order in which life has been developed upon our planet, ultimate or atomic life is the eternal union of atoms in their indefinite dispersion with the all-pervading Spirit-power of God, by which all chemical action is accomplished.

In vegetable and animal life this union with God is lifted a step higher; and we have first, a union of organic functions designed to accomplish definite results; and then the union of the organism with the divine Spirit-power, whose manifestations in the animal we call instinct. In this department death first stands as the inevitable opposite of life. In the life of man, we find a union of organic functions of the highest complexity. This organism is united with the divine Spirit-power to accomplish the same results secured in the animal. Then we have the union of an independent human soul and spirit with the material body to accomplish a higher series of results reaching forward eternally. I have not room to unfold the other forms of human life. The results of perfect life are eternal youth, health, and happiness. The results of human death, dating from its primary inception, are the coming decrepitude of old age, disease, and unhappiness. But all this life is *not* the conscious existence. All material substance, in whatever form, constitutes the unconscious existence. We can only say of it, "It is what it is." The conscious existence is the definitive soul and spirit, whether human or divine. The divine conscious existence says of Himself, "I AM THAT I AM." The human can say nothing less. But anxiously and eagerly you ask me, "What is immortality?" I answer, that while life is a universal state, immortality is a limited state. All entities, whether conscious or unconscious, may exist in a state of life, either partial or complete. But only certain entities, under certain conditions, can exist in a state of immortality. Confining our attention to this planet, man is the only being who can claim the possibility of immortality; and in him it pertains alone to the unconscious entity, his material body. Mortality is not death; but is that state or condition of any material organ-

ism which inevitably results in death, or the separation of the organism from the divine Spirit-power. Immortality is not life; but it is that state of the human material organism alone which ensures the unending union of the organism with the divine Spirit-power, and also with its own independent soul and spirit power. Hence the pertinency of Paul's language in saying that God will render eternal life eternal union with Himself in all the ineffable glory of its completeness,—to those who, by a patient continuance in well doing, *seek* for glory, honor, and immortality. If conscious existence, life, and immortality were one and the same, the pertinency, beauty, and sense of this language would be wholly wanting.

I have not room here for defining the conditions of immortality, nor yet for the arguments and proofs sustaining these statements. But they are ready, and will be forthcoming in all-convincing abundance, if required. The field of research here is new, boundless and rich; and I think will amply repay the reader who may wish to follow me back over the path trod for twenty years past.

THE NATURE OF SOUND AND LIGHT.

GREENVILLE, Pa., June 13, 1881.

Editor Literary Microcosm.

SIR: Appropriate to the now popular question of the day regarding the nature of sound and light, I send you the result of some experiments which I tried, and which strike me as very confirmatory of the substantial nature of light, and which I submit to your readers for criticism.

The first experiment was tried during a bright day last winter, when the sun was shining upon the snow, reflecting its light from thousands of its minute crystalline forms. After darkening a room, I cut a circular aperture, six inches in diameter, in a sheet of manilla paper. This I placed over the lower sash of the window, so that the light was reflected from the snow through the circular opening. Placing myself at a distance of about eight feet from the window with one eye closed and covered, I gazed with the other on the white light reflected from the snow for about half a minute, after which I closed the eye and covered my head with a dark cloth to exclude all light.

Light, according to "science, so-called," consists of a certain number of vibrations of an accommodating ether in a given space, and the difference between one color and another is in the number of its vibrations; that there is no such thing as color but that the vibrations produce certain effects upon the eye which we call

color, and consequently, of course, where there are no vibrations there can be no color. But in the above experiment, after closing both eyes and covering the head, there appeared upon the retina, in place of the circular white spot, one of a lemon color, which gradually darkened into a bright yellow. Upon the inside of the yellow circle there appeared an orange edge, which spread over the field until the whole surface was a bright orange. By the time this change had taken place, the inside edge of the ring was a bright red, which gradually spread over the field until the whole was bright and glowing. At this point, upon the inner edge was forming a beautiful purple, which, after covering the surface of the field in a manner similar to the former colors, was displaced by bright blue, which ended the experiment. The result, as the reader will notice, gave the three primary colors constituting white light, namely, yellow, red, and blue, with the intermediate colors, which would naturally occur by the blending of the primaries as the changes took place.

I next directed my attention to the glowing coals of the stove. Having a theory which reconciles all science and Scripture, I proceeded according to its rules, reasoning thus: The spectrum of hydrogen is black, of carbon blue; therefore an experiment similar to the above should give results corresponding to the united colors of their spectrum, if light is substance and not vibrations. My preconceived ideas were found to be correct, as the impression made upon the retina produced an indigo color.

W. T. A.

ELDER INGRAM ON "THE MICROCOSM."

DEAR BROTHER HALL.

The *Literary Microcosm* has been received, and its contents eagerly devoured. I have three objections to urge against your paper, three questions to ask it, and three compliments to pay it.

OBJECTIONS.

First: The paper and the price are out of all proportion. At one dollar a year, it would be the cheapest paper I know of in the United States.

Second: Its precious visits are to be too far apart.

Third: After beginning to read it, I could not lay it down until I had finished it, so intensely interesting were its well-filled pages.

QUESTIONS.

First: According to scientists, what are the points of conflict between science and the Bible?

Second: Who are the scientists of note who believe in a divine revelation? Please refer to the *evidence* of their faith.

Third: How do you account for the *fact* that scientists, as a rule, become skeptical?

COMPLIMENTS.

First: Your paper is faultless in style. Second: Chaste in language. And third: pure in sentiment.

I hope it may reach thousands of readers before six months have passed by. No paper ever published has made a more timely appearance.

May the God of all grace preserve you—body, soul, and spirit; and give you strength to prosecute this great work. Very affectionately,

J. W. INGRAM.

Omaha, Neb., July 11, 1881.

ANSWER.

In reply to Brother Ingram's questions, we would say—

First: The great question of controversy between modern science and religion, as claimed by skeptical scientists, relates to the single fact of the creation of the universe by an intelligent and personal God. Of course, believers in religion, of all creeds and shades of opinion, agree in ascribing the visible universe to the workmanship of an intelligent creator. Many believers in a divine and written revelation believe in Evolution in its so-called Theistic form though holding to the special or miraculous creation of the first living forms as the start of Evolution. Many Christian ministers hold this view; and, as a consequence, are sadly driven to their wits' end to invent any kind of reasonable interpretation of the Bible account of creation and God's dealings with man. Many other questions of religious belief are subjects of direct denial by infidel scientists, such as the divinity of Christ, the inspiration of prophets and apostles, the resurrection of the dead, &c.; but they are minor questions of conflict, and would have no weight in the minds of intelligent scientists if once the basic fact of God's personal existence and intelligent intervention in the creation of the universe should be fully established, on the principle that the greater includes the lesser.

Second: It is a fact which we are sadly forced to admit that very few distinguished scientists believe in religion at all, while nearly all who may be called eminent investigators utterly reject the Bible as of God, though some of them claim to entertain some sort of an indefinable idea of an unknowable first cause of things, which they vaguely suppose might have been some sort of a God. The vast majority, however, of those great (?) men are avowed atheists,

carrying their radical ideas of evolution and spontaneous generation back even into the cosmogony of the visible universe, and holding that the solar system and all other systems developed and came into form by natural and eternal laws out of primordial cosmic star-dust. This radical view, however, is sensibly beginning to totter; and many atheists admit it as a difficult if not wholly untenable hypothesis.

Third: We have regarded the general tendency toward skepticism among prominent scientific investigators as attributable to three causes. First: the tendency to interpret the facts of Nature and natural phenomena, particularly those relating to living creatures and organic functions, upon purely physical principles, not discerning the invisible and incorporeal world of entities that exist all around us, and which constitute the principal elements of being and Nature which ally us to an intelligent God. Second: The natural pride and perversity of men's hearts in admitting nothing in the universe as having intelligence or dignity above themselves. We had almost said it comes from the fact that the natural heart is at enmity against God, and which leads those who start out to fathom the mysteries of science, without the influence of religion to temper their investigations, to see only the visible and feel only the tangible things with which they come into contact, and in this way to ignore God and religion. Third: An imperfect and in many respects an irrational interpretation of the Scriptures, which, by furnishing much of the material for the ribald tirades of such men as Ingersoll, have tended to bring odium upon the Bible itself in the estimation of scientific men. A grand and sublime conception of God's character as seen in the universe, carried out by an equally grand and sublime interpretation of His character as it shines in His written word, would in time elevate the sacred book, and convert it into a favorite study with thoughtful scientists.

THE PROBLEM OF HUMAN LIFE.

This book continues to receive the most enthusiastic notices of the press, and by private letters from ministers of all denominations. These letters alone would fill many volumes as large as the book itself; and each one vies with the others (without the writer knowing it) in its extravagant language of praise. We take the liberty, in the absence of the editor-in-chief, of quoting a single one as a specimen of hundreds reaching this office, all from Christian ministers who are total strangers to the author:—

CLEVELAND, Tenn., July 6, 1881.

A. WILFORD HALL.

Dear Sir; I write this note to you to thank you, in the name of God, for writing *The Problem of Human Life Here and Hereafter*. I am a minister of the Gospel in the M. E. Church South, a member of the Holston Conference, and in charge of Chatanooga District as presiding elder. My address is Cleveland, East Tenn. Please inform me upon what terms you can furnish *The Problem of Human Life* in quantities to sell again. I thank God that the book ever fell into my hands. I came across a copy accidentally, and bought it, and am now reading it. Oh, how much good it has done me! I feel that God has raised you up to shed light upon those deep dark subjects, which are pregnant with eternal interests to man. As I read along and see how you pull up by the roots *Darwinism* and other *isms* that oppose the teachings of the Bible, I feel like flying up upon the highest fence in the land, standing on the top rail, flapping both wings, and crowing loud and long, "*Darwinism is gone forever!*"

May God spare your life, brain, and pen, to bless your race; and may your works here and your reward hereafter be "as bright and enduring as the sun in the heavens," is the humble prayer of your unknown servant,

JOHN BORING.

NO EXCUSE FOR PROF. TYNDALL.

It is often asked why great scientists find such mental difficulties in accepting the truths of religion and their miraculous confirmation, as attested by so many witnesses. The general answer to this is that miracles seem impossible; and great intellects, under the discipline of the careful scientific training to which they are constantly subjected in their investigations for scientific truths, are debarred from the power of imagining that to be true which seems rationally impossible. Yet these same great scientists will formulate theories as firmly established, and fasten them upon the rising generation of students by incorporating them in their text-books, which they themselves admit are impossible to conceive of, believe in, or even imagine to be true. We have a beautiful example of this in the teachings of Prof. Tyndall in regard to that feature of the wave-theory of sound which requires a hundred different systems of air-waves, as the constituents of a hundred different tones, to be passing through the same air at the same time, crossing and crashing through each other in all directions, and yet each system retaining the perfect form and outline of these assumed waves the same as if no

other sound were present. Prof. Tyndall believes that all these hundred systems of air-waves not only exist in the outside air, but that they enter the narrow passage of the ear to the tympanic membrane, and there act upon this small drum-skin, a third of an inch in diameter, causing it to vibrate in harmony with these hundred different systems of waves at one time, with a hundred different vibrational rates per second (as the pitches of the various sounds all differ), and at a hundred different widths of swing (as the intensities of the different sounds all vary), and that all these oscillations to and fro of this membrane must take place at one and the same time (since, by an act of attention, any particular sound of the hundred can be isolated and distinctly recognized) and, as a part of the theory, that these conflicting motions of the drum-skin are but responses to the battling and bombarding of the air-particles taking place in this narrow passage to the brain which particles are driven hither and thither in obedience to these hundred conflicting systems of air-waves produced by as many musical instruments! Now all this Prof. Tyndall believes, notwithstanding Prof. Helmholtz lays it down as a mathematical law that "Any particle of air can, of course, execute *only one motion* at one time." And again: "It is evident that at each point in the mass of air, at each instant of time, there can be *only one single degree* of condensation, and that the particles of air can be moving with *only one single* determinate kind of motion, having *only one single* determinate amount of velocity, and passing in *only one single* determinate direction." *Sensations of Tone*, pp. 40, 222. Yet after Prof. Tyndall had quoted and indorsed this law of Prof. Helmholtz, he still announces as his scientific belief the perfect and independent action of a hundred, nay "a thousand" conflicting systems of air-waves, and of as many varieties of tympanic vibrations; and what is more surprising, he admits that he believes in all this apparent impossibility in defiance of his own "*imagination*," just because the accepted wave-theory of sound requires it! Here are his words:—

"The same air is competent to accept and transmit the vibrations of *a thousand instruments at the same time*. When we try to visualize the motion of that air,—to present to the eye of the mind the battling of the pulses, direct and reverberated—the *imagination retires, baffled at the attempt*."—*Lectures on Sound*, p. 257.

He thus professes to believe as scientifically true that which his "imagination" rejects as an impossibility, and that which Prof. Helmholtz declares to be contrary to the very laws of science. Under these circumstances, one fails to comprehend why Prof. Tyndall, with

such a sweeping and all-mastering credulity, might not, with a little effort, believe in a personal God and the immortality of the soul, even though it should happen at first to *baffle his imagination*, since such a Being, and such a destiny for humanity, are clearly a reasonable necessity in Nature, while his "thousand" unimaginable systems of superimposed, buffeting, and battling air-waves and correspondingly conflicting tympanic vibrations are manifestly and ridiculously unnecessary to a proper solution of sound-phenomena. Prof. Tyndall, therefore, by his own confession, has no reasonable excuse for not believing in the great truths of religion—the existence of a personal God and a future life for man,—even though his "imagination retires baffled at the attempt."

THE FORM OF "THE MICROCOSM."

MANY of our readers have written us suggesting that we have made a mistake in the form of *The Microcosm*,—that it should have been sixteen pages of half the size as at present, so that the volume, when completed, might be in better shape for binding and preservation. The argument for this change is that many of the articles are of too much value to be spread out in a newspaper of such convenient form to be torn up and wasted. We feel the force of this criticism; and if we live to commence a new volume, and our subscribers stand by us as they show every indication of doing, the paper will be changed as desired, and otherwise be greatly improved. Of course, the present volume will have to go on in its present shape; and the pages, large as they are, can readily be preserved by properly filing them.

[It is now changed to a 32-page magazine the size of this reprint.—EDITOR.]

THE COMPASS-PLANT.

AMONG the wonders of the Western plains, nothing strikes the traveler of a scientific turn of mind with more surprise, especially in the vegetable kingdom, than this singular plant, whose magnetic leaves and petals point constantly to the north star. In the year 1860, while on our way to the Rocky Mountains, we were lost upon the plains while out from camp hunting antelope, owing to a dark and stormy night overtaking us unawares. We knew that the encampment of our train was located about ten miles northwest of where we were thus overtaken. We had already become familiar with the singular peculiarity of this electric weed,

and had often mused upon its strange proclivity to imitate the mariner's needle. The stars having deserted us, we became alarmed at the situation. But the compass-plant flashed across our mind: we dismounted, and groped about till at last our hand struck the familiar leaves, whose singular tendency to point all in one way gave us cheer. It was but a short calculation till the head of our pony was turned in due line toward the camp, which we had the satisfaction of reaching safely in about two hours; but not before we had twice dismounted to feel among the branches of these friendly guides to make sure of our course. Many a traveler's life has thus been saved upon the plains by these wonderful "prairie guides" in the early times of migrations to California and Colorado.

While camping about three hundred miles from Atchison, Kansas, while on our way to Pike's Peak, we first became acquainted with this wonder of vegetation. To demonstrate its pertinacity to point its leaves infallibly northward, we took a spade and lifted a block of the soil in which its roots were embedded, and carefully replaced it so that the leaves all pointed to the south. True as the magnetic needle when the compass-case supporting it is turned, in the morning the stems of the plants had twisted around till all the leaves, as before, pointed due north!

It is strange that chemists and naturalists have not more fully made these plants their study. Electrical mysteries and magnetic properties might be found wrapped up in their leaves and branches and petals that may yet bless mankind in other ways than guiding lost travelers.

Although little has been written upon this marvelous provision of Providence, as it would seem to be, yet the following lines from Longfellow's "Evangeline" are to the point, conveying the idea here given of its mysterious peculiarity, and containing as much truth as they do poetry:—

"Patience!" the priest would say, "have faith, and thy prayer will be answered!

Look at this vigorous plant that lifts its head from the meadow:

See how its leaves are turned to the north, as true as the magnet!

This is the compass-flower, that the finger of God has planted

Here in the houseless wild, to direct the traveler's journey
Over the sea-like, pathless, limitless waste of the desert.

Such in the soul of man is faith. The blossoms of passion,
Gay and luxuriant flowers are brighter and fuller of fragrance;

But they beguile us, and lead us astray, and their odor is deadly:

Only this humble plant can guide us here, and hereafter

Crown us with asphodel flowers, that are wet with the dews of repentance."

PROF. REPPERT IN 'APOSTOLIC TIMES.'

DURING the early summer the above-named professor of physics undertook the task of answering our arguments against the wave-theory of sound. His criticisms were of the bitterest and most vituperative character which have yet found their way into print, and were published in the *Apostolic Times*, a widely circulated religious journal at Lexington, Ky. By the courtesy and at the desire of the editor, Elder B. H. Cozine, we replied to these criticisms in five weekly letters, which appeared in the same journal. These letters gave full quotations from the review of Professor Reppert, and contain many pertinent and condensed arguments in favor of the new departure. We have received several requests to copy these letters into *The Microcosm* for the general benefit of its readers, as the writers regard the arguments of so much value as to be worth preserving in the files of this paper. We may reproduce the concluding three, if this wish should be general, printing one each month till completed,—unless, in the meantime, some representative scientist shall enter the arena in these columns to defend the wave-theory, as suggested in the first number of *The Microcosm*.

We take occasion here to call attention to the *Apostolic Times*, which has so generously given our five long letters to its tens of thousands of intelligent readers. This is no common religious newspaper, but a wide-awake, progressive, thoughtful, newsy, and ably-edited weekly family journal, worthy to occupy a place in every Christian home in the land. It is a large eight-page paper, and very cheap at the price, \$2 per year, or \$1 for six months. Send direct to the editor as above, and secure the paper at least half a year on trial, and you will hardly get along without it hereafter.

THE New York *Tribune* says Bradlaugh, in attempting to take his seat in the British Parliament, was *ejected*. He was more than that. He was *ejected, rejected, defected, subjected, and projected*, all in one operation, because he wished to be *injected* into Parliament.

A REVOLUTIONARY INVENTION.

JOSEPH GOODRICH, of Henry, Ill., invited us to examine his miniature steamship, now exhibiting at 15 Park Row, in this city. It is a practical working model about five feet long, with boiler, engine, steering apparatus, etc., complete, and makes its miniature ocean trips to the surprise of spectators, in a tank about

WHAT AILS THE MAILS?

SINCE mailing the first number of *The Microcosm* to our subscribers, we have received many complaints from agents that only a part of the list of subscribers have received the papers. Out of 24 names at one post-office but five persons got their papers, and at other offices a like deficit, in less proportion. We fail to explain this mystery, as all the papers are duly mailed according to post-office regulations. We took a number of these letters from agents to the proper officials at this post-office, and they declare themselves unable to explain the cause of the failure. All we can do is carefully to perform our part of the work, and then trust the residue to Providence and Uncle Sam. Subscribers who may know of such failures on the part of subscribers to receive the paper will greatly oblige us by sending their names, and we will make good the deficit.

FRENCH AND GERMAN TRANSLATION.

There is a highly accomplished young lady at Benvenuto, Va., now governess in the family of our highly esteemed contributor Col. J. M. Patton, who would be glad to translate for publishers or private parties, either from the French or German, both of which languages are her vernacular. Col. Patton recommends her as highly educated, and every way accomplished for this work. Those who would wish to aid a very worthy and enterprising girl, while serving themselves, can make favorable terms by addressing Mrs. Col. J. M. Patton, as above.

OUR SCIENTIFIC PUZZLES.

This department of *The Microcosm* has proved, at the very start, a decided success, so far as exciting interest among our readers is concerned, having called forth more than one thousand answers to the first puzzle, namely, "Why does a hoop remain upright while rolling, though it falls as it stops?" But we regret to announce that not even an approach toward success has attended the efforts of our correspondents in their attempts to give the correct solution, since not a single answer meets the case. This will be recognized by every reader who has tried to answer it, when he shall have carefully examined the correct solution, which we herewith furnish. Among those who have sent in answers are many professors of mathematics and physical science, as well as ministers of different denominations, civil and mechanical engineers, mill-

sixteen feet long. It is driven by means of an entirely new system of self-feathering blades, attached to endless carriers running along the sides of the ship, which avoids all necessity for the application of complex devices to accomplish such feathering operation, a thing which has been so long sought. Mr. Goodrich discovered that a blade pivoted at the center of its two ends, and thus hung in a frame, leaving it free to revolve, would, if drawn through the water by such frame, naturally turn its broad side to the resisting fluid, whereas any one would have supposed that the blade would present its edge, and thus go through the water with the least resistance. This genuine discovery, or mechanical contrivance, which has been patented all over the civilized world, seems destined to revolutionize the present system of propelling vessels by steam, as by this means a carrier of fifty or more automatic blades, if the vessel is long enough, can be made to travel along its side and take direct hold of the water with such force, and in so many places at the same instant, as almost to avoid slip, and thus allow the entire force of the steam to be expended in moving the boat, instead of churning and displacing the water. Unless we are very much mistaken, the time is near at hand when ocean trips will be made in about the time that the same distance is now made on land by rail, and with as little tremor in the vessel as is usually experienced in a sailing ship under a moderate breeze. When this time comes, we promise ourself an editorial trip to Europe.

"THE REVIEWER REVIEWED."

We have heard nothing from the editor of the *New York Christian Advocate* since the review of his reviewer appeared in the previous issue of *The Microcosm*. Possibly the management, after reading the opinion of the Rev. Dr. Littlepage, which we copied, has concluded that the less said the better, and that the policy of "masterly inactivity" is the wisest. Our office editor suggests that, perhaps, Dr. Buckley is still strudging that "table of contents" to find out "if substantial injustice has been done" the book in regard to those misspelled and confounded "philosophical terms" and that when he gets through with that page he will report. We are in no hurry, but some of the ministers who support his paper, and who have read the damaging statement in the previous issue of this journal, are quite impatient to see a satisfactory explanation from Dr. Buckley. We have a number of letters from Methodist ministers which would make quite interesting reading for him.

tary and naval officers, besides hundreds of students in our colleges from the various departments of science and philosophy. In view of the fact, if it be a fact, that all these answers are wrong, and in view of the astonishing simplicity of the problem itself, is it any wonder that professors of physics should be in error upon the vastly more complex problems involved in sound-phenomena, as maintained in these columns?

Before giving the true solution of our puzzle, we will state that a vast majority of the answers received attribute the upright position of the hoop while rolling to one and the same general cause, variously modified and expressed, namely, the action of centrifugal force, in combination with the projectile force which starts the hoop to rolling. Projectile force, it is claimed, tends to keep the hoop moving in the plane in which it is started, while centrifugal force tends to throw all parts of the hoop outward and principally upward; and that these two forces combined, being greater than that of gravity, prevent the hoop falling laterally till the resistance of the air and the irregularities of the ground overcome its rotary and forward motion, thus leaving gravity free to pull the hoop over toward the side to which it happens to lean. Probably the better way to state this general answer would be to copy one of the letters received as an illustration. Here, for example, is the solution, as given by Prof. L. M. Osborn, L. L. D., Professor of Physical Science in Madison University, at Hamilton, N. Y. :—

MADISON UNIVERSITY,
Hamilton, New York.

Messrs. HALL & Co.

"Why does a hoop while rolling remain upright, though it falls as soon as it stops?"

According to the first law of Newton's Principia, a moving body has a tendency to continue in a given plane. In the case supposed, the only influence opposing this tendency is the force of Gravity when the hoop is inclined from a vertical position, and is very slight until the inclination becomes considerable. While the hoop is in motion, in any considerable degree, the tendency to continue in a given vertical plane counterbalances the disturbing influences of Gravity. When the projectile force is overcome by resistance of air, &c., the hoop must fall unless accurately poised over the point of support.

Further, from the manner in which the hoop is put in motion, every particle must have a tendency in succession to the highest possible point (the hoop remaining in contact with the ground), and this tendency is in direct opposition to the disturbing forces of Gravity. Yours truly,

L. M. OSBORN.

That the projectile and centrifugal forces of the hoop are not sufficient to keep it in an upright position will be manifest with a little re-

flection, since an iron-hoop, if it weigh a ton, rolling on a smooth and level track, will remain upright while traveling so leisurely that a fly, or a bit of loose dust on its surface, would not be disturbed by the action of these forces. To produce any appreciable effect in keeping so heavy a hoop upright, a very high velocity and rotary speed would have to be communicated. This seems self-evident. Yet one professor, from Knoxville, Tenn., who signs himself a "A Teacher," ridicules the idea of offering a prize for the solution of a problem which every schoolboy in the country can correctly explain! He condescends, however to say: "Of course the hoop, while rolling, is kept upright by the action of projectile and centrifugal force, just as the earth is kept in its orbit"; and he adds that this explanation has never been doubted by a scientific man, and refers us to a number of standard authorities in which it is given. We take great pleasure in referring these standard authorities, as well as this self-constituted and erudite "Teacher," to the true solution, here for the first time given.

A few, even among the careful, scientific thinkers who have written us, have supposed that the upright position of the hoop while rolling, is caused by splitting the air, which, in coming together on each side of the hoop, tends to prevent its falling sidewise, the atmosphere acting as a sort of guidewall! One very ingenious lady, Mrs. Rev. S. C. Littlepage, of Bryan, Texas, suggests that the friction of the air on the inside of the hoop generates heat, the heated air naturally rises, producing an upward current, which continuously strikes the top of the hoop, thus tending to drive it in an upward direction, and in this manner preventing its lateral tumbling. We must say that, to our mind, this is decidedly more "scientific," not to say ingenious and original, than the nine hundred odd solutions we have received, based upon projectile and centrifugal force. But the difficulty with all these atmospheric solutions lies in the fact that the hoop would evidently roll better in a vacuum than out of it! What, then, is the true solution, if these are not to the point? We will now give the answer.

First.—In what manner does a hoop fall when not rolling? A correct understanding of this is necessary before attempting to give the answer to our puzzle. It is understood, of course, that the hoop is so narrow across its face—a wire hoop for example—that it will not remain upright without support, however nicely balanced. But such a hoop can be so nearly poised over its center of support, that when left free it will remain upright for a second or so before its lateral or side motion,

either way, will accumulate to more than the fraction of an inch. When thus carefully poised and released, it begins to fall sidewise very slowly at first, its motion being greatest at the top, and less and less around the hoop either way to its point of contact with the ground, *where it has no lateral motion at all*. Now if the *bottom* of this hoop, which has no lateral motion could come up and take the place of the *top* as it commences to fall sidewise, and if this could be done so quickly and continuously as to prevent the side motion at the *top* from accumulating appreciably, it is evident the hoop would not fall, because any tendency to such side motion at the *top* would be almost instantly checked by the *bottom* of the hoop, which has no side motion, coming up and taking its place. This is proved by placing a hoop on a large flat and rather slack belt, running horizontally over two pulleys. Though the hoop remains in one position, without any projectile force whatever, the belt passing continuously under it, causes its *bottom* to come up and take the place of its *top*, before its motion sidewise at the top has time to accumulate. This shows that projectile force has nothing to do with this puzzle. The same thing, precisely, takes place when a hoop is rolling. We thus reach the correct and only answer to the puzzle, namely:—

The *bottom* of the hoop, where there is no lateral or side motion, is constantly becoming the *top* of the hoop, where the lateral or side motion is greatest; and this change occurs so rapidly that the lateral motion at the *top* of the hoop has no time to accumulate before the *top* of the hoop in turn becomes the *bottom*, where its small amount of lateral motion is checked by contact with the ground. A little girl six years old, by actual test was made to comprehend this explanation, and so intelligently did she grasp it that she was enabled to explain it understandingly to her little playmate! What now becomes of the only "scientific" explanation ever given?

The \$10 not having been earned by any one, will be added to the next prize, making \$20 for the first true solution of the scientific

PROBLEM OF THE SPINNING TOP.

EXPLANATION OF THE PHENOMENA INVOLVED.

—It will be observed when a top is started rapidly to spinning, and at the same time tilted over so that one side nearly touches the ground, that it has *five* peculiarities of motion. 1. It revolves rapidly around its axis. 2. It gyrates slowly, or swings bodily around its pivot, or point of support. 3. This bodily or swinging motion takes the same direction as does the surface of the spinning top *on its side nearest the ground*. 4. This swinging or bodily move-

ment becomes faster as the rotary motion of the top around its axis becomes slower. 5. The leaning top tends gradually (if spinning rapidly) to assume an upright position, where it "sleeps," as it is termed, directly over its pivot till its rotary force is expended, when it falls. These are the phenomena that require solution, *but which have never yet been solved*. We claim, however, that they are clearly and easily solvable, on scientific and philosophical principles. We therefore present our readers with

SCIENTIFIC PUZZLE No. 2.

1. Why does a rapidly spinning top, when tilted, tend to assume an upright position?
2. Why does it swing bodily and slowly around its pivot?
3. Why does this bodily motion take the direction of the revolving surface of the leaning top which is nearest to the ground?
4. And why does this bodily movement of the top become faster as its rotary motion becomes slower?

These peculiarities of motion can all be demonstrated by any one, and witnessed in spinning a common toy top.

Owing to the scientific importance of this problem, and the principles involved, we will pay in cash \$20 for the first true solution of the above four inquiries received at this office; and we will pay \$10 in cash for each correct solution that shall be received thereafter, up to the first day of January next. The true solution will be published in the January number of this paper, and the names of the successful correspondents will also be given. The cash prizes will be sent to their owners immediately after that publication. No puzzles will be presented in the October, November, and December numbers of *The Microcosm*, as we think this one will keep our readers busy till the holidays. The correct solution is expected to be reasonably brief, and to explain the cause or causes of the various peculiarities of motion designated above so clearly as to satisfy the mind of a person of fair intelligence and education.

Now, here is an opportunity for students of science to immortalize themselves in solving a problem that has hitherto baffled the skill of the philosopher and scientist. See the general directions with regard to these puzzles in the August number of *The Microcosm*. The progress of this investigation will be noted from month to month in these columns.

A CASH PRIZE WORTH LOOKING AFTER.

A. WILFORD HALL, Editor of *The Microcosm*.

Dear Sir: I have read and re-read your *Problem of Human Life*, till I am astounded at the

irresistible character of your arguments in review of the theories of the great scientists you assail. I am also surprised at the fact that the attention of the leading professors of our colleges has not been more generally attracted to the important discoveries you have certainly made in science. Particularly is this the case with reference to your new departure on the nature of sound. After the most careful examination of your positions and arguments against the received theory of acoustics, I fail to comprehend how it is possible for a physicist to make a successful reply to the main points of your reasoning, though I have detected slight defects in some of your calculations. But these incidental slips, or intentional baits, do not in the least weaken the force of your masterly onslaughts upon the fundamental principles and laws of the theory as laid down in our text-books, and as now universally taught in our schools. I also fail to imagine what motive can influence the managements of our great institutions of learning that they should quietly ignore these revolutionary principles of science so clearly demonstrated in your book, and allow their teachers to go on instilling into the minds of the young men placed under their charge the ridiculous ideas taught in the received theory of sound, which you have so effectually exploded in your book. Such apparent apathy with regard to the true intellectual culture of the rising generation would seem, under the circumstances, to be almost criminal.

As a lover of scientific progress, and as an inducement to awaken attention, and cause action to be taken upon this subject by prominent professors of physical science, I wish to intimate in this letter that they, or any one of them, can win a prize of *one thousand dollars*, in cash, which I will pay, for the successful refutation of your arguments against the wave-theory of sound in the columns of the *Literary Microcosm*, as per your offer in the first number. You are at liberty to make this offer public, if you feel so disposed.

JOSEPH GOODRICH,
New York, Aug. 18. No. 15 Park Row.

A PHONOMETOR WANTED.

Who will invent a *phonometor*? Here is a device worthy of the genius of an Edison,—an instrument that will, when properly adjusted, record the exact intensity or loudness of a sound of any kind, and at any distance from its source; and consequently the exact proportionate decrease of any sound in traveling through different portions of its range. Such

an invention, though difficult, does not seem impossible. The tascimeter will record the heat of a star so distant as not to be visible to the naked eye, and scarcely with the telescope. May not a delicate, sonorous instrument be constructed, somewhat allied to the microphone, that will indicate the true intensity of a sound, and thus settle practically the question of the supposed decrease of sound as the square of the distance? We would gladly hail this invention.

CANNIBALISM vs. DARWINISM.

WHAT is cannibalism? It is the eating of the flesh of one's fellow-being or blood-relation. What is Darwinism? It is the doctrine that every animal, whether mammal, bird, fish, or mollusk, is our fellow-being and blood-relation. Hence, in eating a beefsteak, fried chicken, or broiled mackerel, we are, scientifically, cannibals, because the quadruped, the fowl, and the fish, are our blood-relations, according to Darwinism, having sprung with us, lineally and directly, from the same primeval parents, the ascidian and the moneron. Believers in evolution may profess to be horrified at the Fiji islanders, as they broil and devour steaks cut from the bodies of the men and women they capture in battle, but it is a hypocritical sham indulged in conformity to the enlightened views of all civilized nations. Were I a firm believer in Darwinism, I should have no more scruple in eating a human steak than a fried porgie since they are equally my fellow-beings and family relations, though one is a little more remote in the lineal chain of descent. That's all the difference!

RELIGIOUS DENOMINATIONS.—No. 2.

CHURCH OF THE BRETHREN (GERMAN BAPTISTS).

BY ELDER S. Z. SHARP, A. M.

THIS body of Christians arose in the year 1708, in Schwartzenu, Germany. The general lack of spirituality in the Established or State Church, at that time, induced seven neighbors to meet regularly for the purpose of reading the Scriptures, prayer, and mutual edification, with a view of attaining a higher state of holiness. Not knowing the existence of any organized Baptist church, they were led by reading the Bible to reject pædo-baptism; and by a strict interpretation of the Commission (Matt. 28: 19), to adopt trine-immersion.

Among them was a man of liberal education by the name of Alexander Mack, whom they

chose as their leader, and organized themselves into a church, taking the name of "Brethren" as their title, in harmony with Matt. 23: 8, "All ye are brethren." From their mode of baptizing they were often called Tunkers and Dunkards, from the German word *tunken*, to immerse.

Their number increased steadily, and two other societies were formed beside the original one, but which were soon driven by persecution to Crefelt and Holland, while the original congregation removed to Friesland. Between 1719 and 1729 they all removed to America, and settled in the vicinity of Philadelphia and Germantown. From these points they spread to Maryland and Virginia; and with the tide of emigration were carried westward to the Pacific. No organized churches of this denomination exist in the Eastern States or in New York; but in all the other Middle, Northern, and Western States, in most of the Southern States, and of the Western Territories,—being most numerous in Pennsylvania, Virginia, Ohio, Indiana, Illinois, Iowa, and Kansas.

In church government each congregation maintains the democratic form; and all business matters are decided by the majority vote of the whole church. In the District Conferences into which the States are divided, and in the General Assembly of the whole denomination, known as the Annual Meeting, the republican or representative form of government prevails. To the executive committee of the Annual Meeting only ordained elders are eligible. Each church is entitled to two representatives at the District Meeting, and each District Meeting sends two delegates to the Annual Meeting or General Assembly.

In regard to the so-called "general principles" of Christianity, the "Brethren" agree with the other Protestant Churches. Their peculiarities are, that they have never allowed their members to hold slaves, go to war, hold any office requiring the administration of an oath, nor to take an oath themselves, to join any secret organization, to go to law with their brethren, nor to indulge in the vanities and fashions of this world. As early as 1781, just one hundred years ago, their Annual Council interdicted the manufacture of ardent spirits by its members. None are received into church fellowship without repentance, faith, and trine-immersion. They hold that the Lord's Supper (*deipnon*) is always a full meal, and is eaten in the evening, and differs from the bread and wine of communion which were distributed by the Lord "after supper," (1 Cor. 11: 25). At their seasons of love-feasts (*agapais*) (Jude, 1: 12,) they practice washing the saints' feet (John, 13: 14; 1 Tim. 5: 10,) giving each other the

right hand of fellowship and the kiss of charity. The different sexes always practice these ceremonies separately. "Anointing the sick with oil, in the name of the Lord" (James 4: 14) is a privilege of which many in this church avail themselves when sick.

Although the first Sunday-School ever held was organized at Ephrata, Pa., by one who had been a member of the Brethren, yet the Sabbath-School work, until recently, was greatly neglected in this denomination. Foreign missions Sunday-School literature, and Colleges, have received a great impetus during the last five years. A Home and Foreign Mission Board was appointed a year ago at their General Assembly, and a very successful mission is sustained in Denmark, besides numerous home missions. Three Sunday-School weeklies, one monthly, six church weeklies and one monthly are sustained by this denomination. One academy in Virginia, another in Maryland, a college at Ashland, Ohio, one at Huntingdon, Pa., and another at Mount Morris, Ill., have recently been established by members of the Brethren Church. The two last-named colleges are in a flourishing condition.

The number of communicants can not be given until after the census report is published, but there are 1739 ministers enrolled.

THE BIBLE.

BY REV. W. D. BARGER.

IN looking out over the world, we see one vast graveyard. Millions are passing away every year. Change is written on every page of the book of Nature. Death and decay give birth and life to what follows. The whole future is rushing through the little present into the all-absorbing past. To-morrow, to-day will be yesterday; and soon all that now is will then have been. We examine the sciences, the arts of the world, man's power and fame, and alike we find them all unreliable, changeable if not perishable. With sadness and despondency we see suffering everywhere wrung from the wreck and ruin around us. Then it is that our eyes fall upon the pages of this BOOK, and we read: "The grass withereth, the flower fadeth but the word of our God shall stand forever." "Heaven and earth shall pass away, but my word shall not pass away." Here is something that can not perish. He who builds upon this foundation will assuredly stand.

A few facts might be profitably glanced at. Nations have been born and have passed away since the Bible was written. New customs have come into existence, and formed parts of the government of the world. Manners

have changed, dynasties have crumbled, while the Bible alone, in spirit, has remained the same,—fresh, true, and indestructible as its Author. Linguists have assailed its language,—tested, tried, analyzed, and weighed in the balance, and yet not an iota of its truth has grown weaker, nor one ray of its light dimmer. It has, in fact, been strengthened by the very arguments brought to bear against it, and it has grown brighter by the rubbing it has received. History and geography have tried to measure it. Geology, with loud-sounding blows, has hammered at it. The telescope of the astronomer has been pointed at it for many years,—and still its light shines in our churches and in our homes with intensifying brightness, as the power of God unto our salvation.

What other book has borne such crucial tests, and successfully passed the ordeal? It has fallen from the hands of its worst enemies with its luster untarnished, and not a leaf ruffled. Age has failed to affect its power. Little children read its teachings and comprehend them,—while the sage, with hoary head, drinks in wisdom from its exhaustless springs of truth.

It is the guide to the young, and the solace to the old, cheering the evening of life as the weary pilgrim at last stands upon the borderland of two worlds. When the sound of the grinding is low, and those which look out of the windows are darkened, when the wheel is broken at the cistern, and the grasshopper becomes a burden, when man goeth to his long home and mourners go about the streets, 'tis then that this Book of Books flashes its resplendent light into the surrounding darkness of doubt, illuminating even the portals of the tomb. Such is the book that has lived through the conflict of ages,—which has civilized, elevated, and Christianized the nations of the earth; and such is the Book which the Infidel hordes of Ingersoll, Underwood, & Co. would trample beneath their unhallowed feet, and banish from the earth.

MATTER.

BY W. L. BARNES.

WHAT matter is, in its ultimate analysis, it surpasses the power of the human mind to comprehend. The word itself, as used in modern times, has its origin in the Latin word *mater*—the fundamental or primary meaning of which is a forever unfolding or coming into being, that is, phenomenally. This is its signification in all those languages that have sprung out of the Latin tongue, including the principal languages of modern Europe—the English, German, French, Italian and Spanish.

Elementally, two general theories have pre-

vailed in regard to it; the "atomic" theory, so called; and that of its "infinite divisibility." Historically, the former has precedence in the order of time; though, doubtless, the general consideration of the entire subject must have extended back through all ages. It is impossible to conceive that thoughtful men anywhere, or at any time, should not have been impressed with the wonderful phenomena attending it; equally impossible that they should not have attempted to resolve them.

The earliest records of these discussions are to be found in the classic ages of Greece,—Leucippus having the honor, as now generally accepted, of having first broached the atomic theory. Conspicuously, he was followed by Democritus; and later still, if our memory serves us, not to mention minor authors, by Lucretius; and later still, by Epicurus, whose elaborate consideration of the theory entailed upon it the distinction of the Epicurean philosophy.

The prominence then given to the atomic theory continued till quite modern times; and is even now, the accepted one, by all materialists, and scarcely controverted by many others. As a philosophy, therefore, it has the undoubted prestige of age; and also of justly eminent authority.

As the theory has no foundation whatever, either in observed phenomena, rightly understood, or sound reason, its prevalence indicates the tenacity with which all errors are held, when they fall in with the natural tendencies of the human mind and heart. It cannot be denied that the atomic theory has been defended chiefly by the materialists of all ages; and so has come to be considered the expression of a disbelief in the supernatural. This is to be regretted, since the subject is a purely scientific one, and should have been accepted or rejected merely upon such grounds. We fail to see what necessary connection there is between the theory and a disbelief in the supernatural.

The atomic theory presupposes that all matter is composed of ultimate atoms, incapable of either multiplication or division,—the more radical of its advocates holding that they are inherently possessed of properties out of which have sprung all phenomena of being whatever. This is the pantheism of all times, ancient and modern,—conspicuous among the present defenders of which is Professor Hæckel of Jena University, Germany; including, nevertheless, all who defend the senseless doctrine of evolution, so called, in its atheistic forms: and, sad to say, so far as mere physical development is concerned, by all those who defend its theistic forms.

Space does not permit our entering into details at this point; and it is the less necessary, that the groundlessness of the theory will be equally apparent, by even a brief consideration of the opposing doctrine—the infinite divisibility of matter; as a consequence of which, the latter, in its ultimate analysis, is to be regarded as a plastic, jelly-like substance, and not atomic, in the philosophical sense of that term.

Believing as we do, in the existence of a Supreme Being, as a distinct and personal entity, all whose attributes are infinite in their nature, we lay down the proposition that He is the creator of matter, combined and uncombined, so far as all natural processes are concerned, and that matter thus defined, is a revelation, *pro tanto*, of Himself, and of His infinite attributes, to finite intelligences on the earth. As, now, matter was created out of nothing comprehensible by finite minds, by the power and word of God alone, its infinite origin is apparent; its infinitely attenuated and expansive character as well. As thus created, all scientists as well as philosophers agree that the earth was once a gas so attenuated as to be almost if not entirely beyond recognition, except inferentially. What difficulty, therefore, in going a step further, and postulating its creation out of nothing comprehensible by finite minds? Any other supposition is crowded with infinite impossibilities.

Practically, the careful consideration of a single experiment will go far to settle this vexed question. A perfect vacuum is said to be impossible. Why? Simply because the air—a material, ponderable substance—is infinitely expandible. Take a suitably constructed receiver for example. Before any of the air is exhausted, the pressure of the air inside is the same that it is externally,—say fifteen pounds to the square inch. Exhaust, now, one half the quantity of air. Is the vessel only half full, or is it as full as ever? the internal pressure being however, only half that of the external atmosphere. Clearly the latter is the fact. Exhaust again the half of what remains. Is the vessel, now, only half full?—or is it still full, and the internal pressure only one quarter that of the external atmosphere? Indubitably the latter is the fact. Suppose the process to be repeated, *ad infinitum*, will not the same relative state of things exist? Clearly it would. Professor Crookes, of London, England, has succeeded in obtaining a vacuum the equivalent of one millionth of an atmosphere; and yet so far as volume is concerned, his exhausted receiver is as full of air as at the first. If this be so, and his beautiful experiments may be witnessed at the laboratory of Professor Eaton, of

Brooklyn, what other result can be reached, if the process be continued to all eternity?

Applying the atomic theory, however, to this experiment, as soon as the air begins to be exhausted the atoms begin to be separated more widely apart, acting by a repulsion to the limit of expansibility, and therefore to have absolute spaces between them. A fatal objection to this theory is seen in the fact that the air is a ponderable substance, and subject to the law of gravitation. As soon, therefore, as the limit of expansibility has been passed, the ultimate, indivisible atoms would fall to the bottom of the receiver,—accomplishing thus an absolute vacuum, so far as the main body or upper portion of the receiver is concerned. It is manifest, in such case, that all internal pressure would soon cease to exist; and that all talk of a millionth of an atmosphere would be inconsequential nonsense.

If this view of the atomic theory, and the ponderable character of the ultimate atoms of matter be correct, what becomes of the idea of the “bombardment” of these atoms, under any conditions whatever? Much is made of this assumed phenomenon by nearly all writers on this subject; but we fail to perceive, *recondite* as the whole subject must be admitted to be, any consistency whatever in the assumption. Difficult as it is to reconcile the phenomena exhibited, experimentally in this direction, they must necessarily, we think, be explained upon the theory of the infinite divisibility of matter, and not upon the atomic theory.

Further to illustrate the insuperable difficulties involved in the atomic theory, suppose an atmospheric receiver to contain, before exhaustion commences, 100,000,000 ultimate atoms. If, now, in the process of exhaustion, one half the number of atoms, at each application of the pump be removed, it would require only twenty-seven such applications to reduce the number remaining to one. If the number of atoms in such receiver, at the first, were 1,000,000,000, it would require only four additional applications of the ratio to reduce the number to one, as before: a corresponding result would be reached with respect to any greater number, however large.

If now, by repeated reductions, the number of atoms be reduced to one, what ground is there for the apparently ludicrous assumption of “bombardment”? Especially pertinent is the inquiry, in view of the fact that the atmosphere is a ponderable substance, and subject, like all other similar substances, to the law of gravitation.

Want of space forbids the further consideration of this interesting and instructive subject.

at present. We have said enough, however, to indicate the proper line of investigation, if we would arrive at truth and not error.

HUXLEY'S "BATHYBIUS" HAECHEL'S "MONERA."

WASHINGTON, D. C., July 31, 1881.

A. WILFORD HALL.
Dear Sir: In 1868 Professor Huxley discovered "Bathybius," which he claimed "was a shining heap of jelly on the sea-bottom,—structureless clots of albuminous carbon, which, although inorganic in their constitution, yet are all capable of nutrition and accretion." This was to become—indeed, was already—the bridge spanning the chasm between the organic and inorganic. In other words, it was the long-lost missing link for which Darwin had been so anxiously looking. "As devout believers in 'Bathybius,' 'educated men,' Strauss affirmed, 'could no longer be Christians.' But alas for 'Bathybius'! It had scarcely appeared upon the stage of life before the German naturalists, at a meeting in Hamburg, in 1876, publicly intimated it. It was prematurely born, and out of wedlock at that! But worse than all this, the ship Challenger discovered in 1873 that "Bathybius" is sulphate of lime; and that when dissolved, it crystallizes as gypsum. And still worse, *The American Journal of Science* says that Huxley has withdrawn his adhesion to his theory about "Bathybius." Thus "Bathybius" takes its place among the dematerialized ghosts of unsavory and unblessed memory. And yet, Joseph Cook says: "Nevertheless, in his now book definitive of the doctrine of evolution, Professor Huxley speaks of a 'gelatinous mass,' which, so far as our present knowledge goes, is the common foundation of all life." As by his own confession, no such gelatinous mass has ever been observed, his popular assertion that our "knowledge" goes "so far" as to establish that this gelatinous mass not only exists, but is the foundation of all life, is contradictory of his published retractions of his theory before scholars. The observed "Bathybius" now becomes an infernal "Bathybius." The chasm was not bridged by actual observation; but it must yet be bridged, even if only with a guess, and a rejected theory. This substitution of the inferential for the observed is unscientific."

Haechel's "Moneron" is Huxley's "Bathybius." But as a ghost is a ghost, no matter by what name you call it, with the arguments of Huxley and Strauss those of Haechel take their place among exploded and ludicrous errors. Huxley called his discovery (?) *Bathybius Haechelii*. Ernst Haechel, well knowing the

I was reminded of the above by reading your reply to Rev. G. H. Sheldrake, where you speak of Haechel's spontaneous generation "Moneron" as surpassing his (Sheldrake's) "model human soul." This "moneron" is a veritable "Wandering Jew,"—a vagabond without acknowledged parentage, a materialized ghost, and dematerialized. Materializing spontaneously, and dematerializing by reason of intellectual force,—a cranky tramp of German extraction, but disinherited, disowned, and expatriated, because of its unsavory odor and general unsatisfactoriness.

The more I study your book the more I am persuaded that your arguments are unanswerable. I have not heard from Joseph Cook, directly, since he left the United States. As soon as I ascertain his precise location, I intend writing him for his opinion of "The Problem." Before he left this country he told me he would be glad to hear from me, at any time, on these questions. I think now would be a good time to make him happy (?). Respectfully,

P. C. CHECKS.

MENTAL pleasures never cloy. Unlike those of the body, they are increased by repetition, approved by reflection, and strengthened by enjoyment.

REMARKABLE INCIDENTS—WHAT DO THEY SIGNIFY?

BY ELDER J. B. MAYFIELD.

THERE is a gentleman, residing at this time in this city, who several years since was brought to death's very door. The physician told him he must die, and he made up his mind accordingly, and was so indifferent as to just how the case would terminate, that, as he said to me, "I would not have given the toss of a nickel to decide the question, either for life or death." Just at that point, attended by a lady and gentleman, and simply waiting as he supposed for death, he says he saw two beings, whom he supposed to be angels or spirits, resting, horizontally about midway between the floor and the ceiling,—one just above the other. He called the attention of the attendants to what he saw, but they said they could not see anything. He then told them that he saw these angels or spirits as distinctly as they saw (the attendants), or as distinctly as they saw

each other. He says he is absolutely certain he was conscious at the time, and that no change took place in the state of his mind from that time forth which would indicate that he was not as conscious then as at any time since or before.

At another time, while at work near a roadside, this gentleman, with his face turned away from the road; saw, he says, some distance away, a man and a boy coming down the road toward him. He saw these persons, as we often see objects off to the side of us, without looking directly toward them. He says he continued at his work until they passed him, and were therefore on the other side of him, and near him. Then he recognized the man as one who had been confined for some time in an insane asylum in Ohio, and spoke to the man. They spoke some words and the man and boy passed on. Now comes the strange part of the story. It was ascertained very soon afterward, beyond the possibility of mistake, that this man, whom he supposed he saw, was at that time in the asylum in Ohio. Then he consulted another gentleman who was working near him when the incident occurred, and he testified that he heard him talking to some one, but could not see any one. He says he had known the man who was in the asylum long and well, and could not have been mistaken about his identity.

Some time after, the same gentleman saw the following remarkable vision.

[We give the conclusion of this vision by recording the words of the man who came to him from an exploding cloud.—*Ed. Microcosm.*]

With these words he led him southward, where two roads met; and seated there he spoke as follows: "What you call electricity, in the other world is spirit. As to their *substance*, they are one and the same thing. In only one respect do they differ, namely, the one is organized and the other is not. What you call electricity is everywhere, and in everything. When a child is born the electricity in the body becomes organized, and takes form with the body, and becomes more and more substantial day by day. The body is but the tent, so to speak, in which this organized electricity lives; and when the body dies, that which is within enters its final state of existence." Many other things were said, to the same effect, but this impressed him most.

Now I call especial attention to the following considerations with reference to the gentleman to whom these incidents belong.

First: He is one of the most matter-of-fact and sensible men I ever knew. Second: There is nothing visionary about him; and he is at the farthest remove from anything like super-

stition. Third: He is violently opposed to what is known as "Spiritualism."

What shall we therefore say to these things?

[We know not just what to say about such appearances and impressions as here described, which have been witnessed and experienced occasionally by peculiarly sensitive natures in all ages of the world.—*Ed. Microcosm.*]

A CITY IN THE AIR.

IN the lower part of New York there is steadily going on a process of reconstruction which, with no great stretch of the imagination may be called building a city in the air upon the old one. The new buildings so far overtop the old, that, viewed from the general level of the roofs, they rise aloft like the scattered structures of a new town having for a foundation the summit of the old one. When the process of rebuilding has gone on for one or two decades more there will be in lower New York what will practically be a new city superimposed upon the present city. The lofty buildings which now tower far above the old average roof level will no longer be isolated objects, but will only be parts of continuous blocks of solid new structures, ten or twelve stories high. By the aid of the steam elevator the building space of the city is doubled. Rooms on the tenth floor are rented for better prices than could formerly be had for similar rooms on the fourth. We need no longer ask how the great city is to find space for its growth. It has solved the problem for itself by converting its roofs into building-lots, and doubling or trebling its area of floor space.

But now comes another question. When the population and business of a given area are thus doubled or trebled, how is its traffic to be carried on in streets that can hardly now accommodate the processions of carts and wagons that press through them from morning to night? All the principal business streets are already overcrowded. Blockades are of daily occurrence. No one who takes a street car on any of the lines west of Broadway, in the busy hours of the day, can tell at what time he will reach his destination. Below Canal Street there are delays at almost every block from the crowd of vehicles. How can the capacity of these streets be enlarged to meet any increased demand upon them? This problem, too, will no doubt be solved. We must open new avenues below the surface for the transportation of heavy freight. We believe the time will come when every important thoroughfare will be tunneled. Railroads for freight traffic will run through these tunnels to the depots and

wharves, and goods will be shipped upon cars from the cellars of the stores and warehouses, instead of being loaded upon trucks at the street doors. The streets will then be free for the lighter traffic, and the sidewalks unencumbered by crates, boxes, and bales. The New York of the future will hold its head high in the air and plant its feet deep in the ground. The city of the present day is in a transition state. Who can prophesy of its greatness and beauty a century to come?—*Tribune*.

MICROCOSMIC DEBRIS.

All the chief French lighthouses will soon be lit by electricity, and provided with powerful steam trumpets for fog-signals.

One twenty-fifth of the whole population of the United States resides within a radius of ten miles from the City Hall of New York.

White alligators found in Brazil travel far and well on land. Their skulls and bones are frequently seen in the forests, and they deposit their eggs in the woods.

A new marine plant, *fucus vesiculosus*, is claimed by Brazilian druggists to be a sovereign remedy against obesity. Fat people can try it without any risk to health.

President Porter, of Yale College, in a recent address at Chicago, stated that of the 800 hundred students of the Scientific School, not over 20 have graduated tainted with Darwinism.

The "White House," at Washington, was so named after it was burned by the British in 1815, when the smoke so blackened the free-stone walls that it was painted white.

During the last fifteen years of slavery the South raised 46,675,591 bales of cotton. During the first fifteen years under freedom—from 1865 to 1880—the number of bales produced was 56,428,335.

The drains leading from the Philadelphia mint yielded about \$1000 worth of gold and silver at the last annual scouring. The recovery of metal by that operation has amounted to \$21,000 in nineteen years.

The capacity of some famous European churches is given as follows: St. Peter's, 54,000 people; St. Paul's, 35,000; Notre Dame, 20,000; St. Stephen's, Vienna, 12,400; St. Mark's, Venice, and Milan cathedral, 7,000.

Between 1841 and 1880 about three-fifths of the known supply of gold, obtained during nearly four centuries, was poured into the market. Nearly one-quarter of the silver produced was also obtained during the same time.

The Eucalyptus tree has been found very effective in banishing malaria from many fever-plagued regions of Southern Italy, Corsica, and Algeria, where the atmosphere, before tracts of the trees were planted, was pestilential.

The existing cedars of Lebanon are only 900 years old. The cypress trees at Montezuma, Mexico, according to a French botanist, are 6,000 years old, and consequently he makes them out coeval with the creation of the world.

A peculiar kind of worm, grublike in form, about an inch long and partly encased in a silicious shell, has been found burrowing its way through stiff clay in the Lord Lorne mine, near Gold Hill, Nevada, 300 feet below the surface.

"If a doctor has the luck to find out a new malady," says Oliver Wendell Holmes, "it is tied to his name like a tin kettle to a dog's tail, and he goes clattering down the highway of fame to posterity with his attachment following at his heels."

Parsees around the "Towers of Silence"—whither the corpses of Parsees at Bombay are taken immediately after death to be devoured by vultures—will often wait and watch until every atom of the flesh of those they love has been consumed by the birds.

Land, a leading English agricultural paper, says that the most profitable crop garnered in England this season was on a sandy farm of sixty acres. It consists of pheasants' eggs, which sell at from 25 to 30 cents apiece. The whole crop has been sold for \$10,000.

If a person of fair complexion is exposed to the electric light the hands and cheeks will show all the symptoms of "sunburn" even in midwinter; and he will develop freckles on his face as quickly as when he goes about unprotected by a sun-umbrella in midsummer.

There are five cities in the world having each a population of over 1,000,000 inhabitants—one each in England, United States, Germany, France, and Austria. There are nine having more than 500,000 inhabitants—three in Great Britain, three in the United States, two in Russia, and one in Turkey.

In southern California there is a hollow tree that has been converted into a dwelling. Doors and windows have been put in, and floors built for eight stories, the entrance being made by means of a ladder. The upper room is prettily shaded by a small balcony that in turn is shaded by the tree itself.

GOOD ADVICE.—If misfortune have befallen you by your own misconduct, live, and be wiser for the future. If your character be unjustly attacked, live: time will remove the aspersion. If you have kind and faithful friends, live, to bless and protect them. If you have hope for immortality, live, and prepare to enjoy it.

Some boys in Pottsville, Pa., caught a rat in a trap, saturated it with turpentine, and set it on fire. The door of the trap sprang open, the rat dashed out, and in his agony crawled up the trowsers of the boy who did this act of cruelty. The boy's leg was terribly burned, his clothes took fire, and his life was for some time despaired of.

Silk first came from China, and the Chinese still have many important secrets connected with it unknown to Europeans. In a good year they send as much as \$25,000,000 worth of raw silk to England alone. The "hanks," or books as they are called, arrive with caps made of a single cocoon. This is done by a process unknown in Europe.

On a plantation in Georgia one night recently there was a heavy shower of rain. The next morning acres of land was covered with what is known as spring lizards. There were bushels of them all around, and they covered the ground so thick that the negroes could hardly find a clear spot on which to eat their breakfast. By noon they were all dead.

Rev. C. W. Bardsley sends to the office of the Palestine Exploration Fund a drawing and an account of the ancient mouth of Jacob's well, which he has recently uncovered. It is much worn by ropes. If the first church built over the well dates from the second or third century, which is highly probable, there is nothing to prevent this stone from being the very stone of the narrative.

When Napoleon Bonaparte came, after a series of victories, to visit annexed Belgium, he found, on entering Ghent, a triumphal arch erected by the guild of butchers, inscribed: "The little butchers of Ghent to Napoleon the great" (butcher). The deacon of the guild had asked a clever nobleman (who loathed Napoleon) to write the inscription, the sarcasm in which the worthy deacon did not detect.

A tree grows in Nevada, known as mountain mahogany, which is as hard as boxwood, and is of very fine grain. It is of a rich red color, and very heavy. As fuel, it produces intense heat, burning with a blaze as long as ordinary wood would last, and then retaining its form and lasting twice as long as ordinary wood. The only objection to it as a fuel is that it burns stoves out more rapidly than coal.

"Judge," said a Western lawyer, "isn't e-q-u-i the way to spell equinomical?" "I think so," said the Judge; "but I'll look it up in Webster's dictionary." He fumbled over the pages for five minutes, and then exclaimed: "Well, I've always been a Webster man, and voted for him for President; but any man that will write a dictionary and leave out such a common word as 'equinomical' can't have my vote any more."

At Argostoli, or Cephalonia, where Lord Dufferin lately touched on his way to Constantinople, is a mill worked by a stream flowing from the sea. An Englishman discovered that the water always ran one way, and built a mill which has made his fortune. He tried hard to find where the water, which disappears into the earth, ultimately went; and, among other experiments to that end, poured oil on its surface, but its course remains a mystery.

A compound is described for the preparation of what are termed safety envelopes. That part of the envelope covered by the flap is treated with a solution of chromic acid, ammonia, sulphuric acid, sulphate of copper, and fine white paper. The flap is coated with a solution of isinglass dissolved in acetic acid; and when this is moistened and pressed down on the upper part of the envelope, a cement is formed, entirely insoluble in acids, alkalies, hot or cold water, steam, etc.

James Rosendale, a native of Palestine, has deciphered one of the inscriptions on the famous sword of Miles Standish. It is in Mediaeval Arabic, and means, "With peace God ruled His slaves (meaning creatures), and with the judgment of His arm He troubled the mighty (meaning the most powerful) of the wicked." Mr. Rosendale thinks this ancient sword is among the oldest weapons in existence. It was acquired by Standish when fighting against the Turks.

The portrait of Adam in the Sistine chapel, painted by Michael Angelo, has faded until his left eye is almost invisible. But even in far worse plight is that of God, painted by Raphael, in the Louvre. The painter boldly represented the Creator of the Universe as a naked old man, with long flowing beard, and bald on the top of his head. Lapse of time has caused the beard to disappear entirely, thus giving the whole figure the most comical and undignified aspect imaginable.

Official returns show how vast are the flocks of sheep owned by the Australian sheep-farmers. The New Zealand and Australian Land Company owns 300,000 sheep; Mr. Robert Campbell, 386,000; Mr. George Henry Moore,

90,000; Messrs. Dalgetty & Co., 208,000; Sir Dillon Bell, 82,000; Hon. William Robinson, 68,000; Sir Cracroft Wilson, 40,000; Mr. Kitchen, 80,000; and Mr. Allan McDean, 500,000. There are in New Zealand alone 12,000,000 sheep. A hundred years ago there were twenty-nine.

It is said that a person wearing dark clothes is more liable to infection from contagious disease than one wearing light-colored garments, because particles which emanate from diseased or decaying bodies are much more readily absorbed by dark than by light fabrics. This may be demonstrated by exposing a light and a dark coat to the fumes of tobacco for five minutes, when it will be found that the dark one smells stronger than the other of tobacco-smoke, and it will retain the odor longer.

Glass sleepers for street railways have been tried with good results; and it is proposed to make broad longitudinal sleepers of glass, having a groove in the upper surface, and so combining in themselves the functions of both sleepers and rails, do away with the necessity for separate iron rails, with their fastenings, joints, and other complications. It is claimed that by properly tempering glass with oil, this brittle substance can be made, mass for mass, stronger than steel, and practically unbreakable.

A wild goose joined the flock of a farmer near London, Canada, but only appeared at meal times. After satisfying its appetite it was noticed to pick up an ear of corn and fly away. After circling about, it dropped apparently into the river. It was discovered that it carried the corn to a sick and disabled companion that could neither walk nor fly. Finally the visits ceased; but shortly afterward the sick gander wandered into the camp and gobbled up the corn himself, and has remained with the flock.

Since the Revisers completed their work on the New Testament a manuscript of the Gospels of Matthew and Mark has been discovered in Italy, dating back as far as the fifth century. Its leaves are of purple parchment, and the writing is in silver ink. There are many illuminations and pictures. It is in every respect a remarkable manuscript. No authoritative statement is made as to the light which would have been shed on the work of the Revisers if this manuscript had been discovered a year or two earlier.

Mephisto, a mechanical chessplayer invented by Mr. Gumpel, and actuated on a principle entirely different from the famous automaton of Von Kempelen or the other androïdes with

men concealed within them which have been previously submitted to the public, is now being shown in London. How he sees the moves that have been made, and how his arm and fingers work so perfectly that he can seize any piece he selects to play or to remove from the board, are puzzles which players fond of problems may set themselves to solve.

According to the census, fourteen States hold the same rank that they held in 1870, sixteen have dropped to a lower place and six have risen. New York continues to stand first, Pennsylvania second, Ohio third, Illinois fourth, Missouri fifth, Indiana sixth, and Massachusetts seventh. Texas has increased more than any other State in the Union. The fifteen Southern States have gained 4,277,700, while the twelve Western and Pacific States have gained 3,581,805. The percentage of increase in the South is 31.05, while in the North only 25.85.

The sign language of the North American Indians has been newly considered by Colonel Mallery, who argues against the theory that the tribes speaking mutually unintelligible dialects, or languages, have a common system of signs. He believes that the signs were used to enforce, rather than to convey, meaning. The Indians in general know comparatively few or the more abstruse signs, though facility of expression by simple signs is common among them, and is due to wandering individuals frequently coming in contact with tribes whose speech they cannot understand.

A correspondent of the *Scientific American* says: "Let any one who has an attack of lock-jaw take a small quantity of turpentine, warm it and pour it on the wound, no matter where the wound is, and relief will follow in less than a minute. Nothing better can be applied to a severe cut or bruise than cold turpentine: it will give certain relief almost instantly. Turpentine is also a sovereign remedy for croup. Saturate a piece of flannel with it, and place the flannel on the throat and chest, and in every case three or four drops on a lump of sugar may be taken inwardly."

A Roumanian engineer, Trajan Theodoresco by name, has invented a new description of torpedo or submarine boat, whose peculiarity is that it is capable of maneuvering under water for twelve hours continuously. It can act at depths of from 100 feet in rivers to 700 or 800 feet in the sea. It is able, through the agency of screws, to rise or sink noiselessly, and either suddenly or gradually by successive stages, and can move or maneuver in any direction. The illumination of the vessel is internal, and enables the officers upon her to see for a distance of 130 feet under water.

There are at present, in the Old World and the New World, more than a hundred thousand railway locomotives. Their total force is equal to 30,000,000 horse-power, and all the other steam-engines on the globe are estimated at 46,000,000 horse-power. The technical "horse-power," however, is really equal to three average horses, and each horse to about seven men,—the aggregate power, therefore, of all the engines being vastly more than the effective force of all the human workers in the world. About four-fifths of the steam-engines now at work have been made within the last twenty-five years.

The successful storage of electricity for transmission in packages of any size to suit customers, accomplished by M. Faure, is attested by Sir William Thomson of the Glasgow University, who carefully measured the electric energy contained in the box recently sent him from Paris, and ascertained that there was no important loss. Sir William can already point out valuable uses for this new reservoir. It can do for electric light-supply what a house-cistern does for domestic water-supply; and steamships can be lighted from a stock of electric energy taken aboard at the start. No doubt other uses will be found.

A fish differing from any other ever seen was picked up on a plantation near Drayton, Ga., immediately after a heavy rain recently. The fish weighed two pounds, its head constituting the principal part. It had a reddish color, and two large paddles on each side, which could not be denominated fins. While in a natural position its tail rested flat on the ground, being turned conversely to other fish. It was also destitute of eyes, they scarcely being perceptible, while it had natural appendages for its ears. The gentleman who found the fish wants some scientist to explain where this strange creature came from.

The metric system of weights and measures is advancing in the United States. It was legalized here in 1866, and has now been made obligatory by the Marine Hospital Service and the United States Coast Survey. The Boards of Education of several States have introduced it in the public schools, while a knowledge of it is required for admission to most of our colleges. The multiplicity of measures in continental Europe—an outgrowth of the feudal system—was long a barrier to commercial intercourse. Until recently there were more than one hundred measures there bearing the name of foot, no two of which were alike.

The work of building a successor to the famous Eddystone lighthouse has gone forward

so rapidly that it is now thought the completed structure will be in use a full year earlier than at first expected. The building of it was not made necessary by any failure of Smeaton's structure, for that in itself is pronounced as safe as it was a century ago; but the rock that supports it has yielded so much to the action of constant waves and many storms as to endanger the foundation strength. The new light is 120 feet away from the old one, and very much larger. Its focal plane is 150 feet above the sea, while the old one is but seventy-two. In clear weather its range is nineteen geographical miles.

Dr. Thomas D. Spencer argues, in the *Popular Science Monthly*, that in most cases death is painless. "It is a physiological process," he says, "and ought to be free from suffering. When the fiat of death went forth, Nature kindly provided an anæsthetic for the body. As the end of life draws near, the respirations become slow and shallow, interrupted now and then by a deep, sighing inspiration, as though the lungs were vainly endeavoring to throw off the palsy creeping over them. As the intervals between the inspirations grow longer, the blood becomes saturated with carbonic acid gas,—the same as that formed from burning charcoal, whose deadly fumes have so often aided the suicide painlessly to destroy life." Dying is therefore very much like gently falling to sleep.

A new and most ingenious speaking machine has recently been exhibited by Herr Faber before the Physical Society, London. It is designed to more perfectly imitate mechanically, the utterance of the human voice, by means of artificial organs of articulation made on the human model, and it is worked by keys like a musical instrument. A bellows made of wood and India-rubber serves for lungs; a small windmill is placed in front of the bellows to give trilling sounds; the larynx is made of a single membrane of hippopotamus hide and India-rubber; and a mouth with two lips, a tongue, and an India-rubber nose complete the organs of the apparatus. Fourteen distinct sounds are uttered by it; and, by combining these, any word in any language can be produced,—also whispering and laughing.

INCREASE OF INSANITY.—A recent medical paper on insanity, while admitting that it is largely increasing, and is covering an extensive range of mental affections, avers that we know next to nothing of its pathology. It is thought to be a disease of physical degeneration rather than one of civilization (as stated by Esquirol); but the causes of mental disease, its course, and its methods of cure, are re-

garded as yet remaining undiscovered. It is estimated from statistics that one in thirty of all persons reaching the age of twenty may be expected to become insane in the older States of the Union. Insanity is found to be much less prevalent in new and fresh places than in those where the population is centralized; is more common in the Eastern cities than in those of the West, and is least often met with in the farm districts of our new States. Its frequency has become more and more strongly marked in the last twenty-five years, and a much closer attention to neurological investigations is recommended.

Persons who are fond of tracing great events to small causes may find a strong instance in the death of the late ex-Prince Imperial of France. He was very agile, and would unquestionably have vaulted into his saddle, with an excellent chance of escaping from the Zulus; but the leather of the saddle-flap (probably supplied by a fraudulent contractor, whose nefariousness was overlooked by a careless inspector of stores) tore in his hand, and a piece of rotten leather perhaps changed the fate of empires.

One of the most striking circumstances connected with the recent review of 52,000 volunteers in Windsor Park, England, was, that no General ever before commanded at one spot so large a number of British-born troops. At the review by the Queen at Edinburgh, in 1860, 21,524 Scottish volunteers were out; and at the different reviews which have since taken place this number has never been exceeded by more than two or three thousand. On the battle-fields of some of the most famous British victories, there were of regular British troops in round numbers, at Salamanca, 26,000; at Vittoria, 35,000; at Toulouse, 40,000; at Waterloo, 24,000. At the review in the Crimea at the end of the war there were only about 25,000. That no British General ever before commanded at a review 50,000 troops of any nationality is, says the *London Times*, a fact beyond dispute.

A SAD MISTAKE WITH CHILDREN.—A great mistake which almost all parents and nursemaids commit is that when the child takes a whim against doing what he is wanted to do—will not eat his bread and butter, will not go out, will not come to his lessons, etc.—they lay hold of him, and drag him to his duties; whereas a person of tact will almost always attract the child's attention from its own obstinacy, and in a few minutes lead it gently round to submission. Many persons would not think it wrong to break down the child's self-will by main force, to come to battle with him and show him that he is the weaker vessel, but

my conviction is that the struggles only tend to make his self-will more robust. If you can skillfully contrive to delay the dispute for a few minutes, and draw his thoughts off the excitement of the contest, ten to one he will give in quite cheerfully, and this is far better for him than punishment and tears.

Queen Victoria has attained her 61st year, an age exceeded by eleven only of the sovereigns of England, dating from the Norman Conquest.—namely, Henry I., who lived to the age of 67; Henry III., who lived to 65 years; Edward I., who lived to be 67; Edward III., who attained 65 years; Queen Elizabeth, who reached 69 years; James II., who lived 68 years; George I., 67 years; George II., 77 years; George III., 82 years; George IV., 68 years; and William IV., who lived to 72 years. Queen Victoria has reigned over England 43 years, a period which has not been exceeded by more than four English sovereigns, namely, Henry III., who reigned 56 years; Edward III., who reigned 50 years; Queen Elizabeth, who reigned 45 years; and George III., who reigned for the long period of 60 years. During the reign of Queen Victoria every other country of the world, from the least to the greatest, has had changes of rulers.

This is the age of great dictionaries. France has produced her *Littre* and Germany her *Grimm*. The scale on which these dictionaries are done is so vast that it is no wonder that a number of special lexicons have grown up by their side. Thus by the side of *Grimm's* enormous work are the two great dictionaries of Bavarian and Carinthian German; and the first part (from A to *Agnus Dei*) has been published of a great Swiss dictionary, which will be a prodigy of its kind. This first part, extending over less than half of a single letter, is the first result of the labors of nearly twenty years. The first idea of it was conceived in 1845; but it was not till 1862 that the Antiquarian Society took the matter up, and organized a commission of representatives from every German-speaking canton, by whose means workers for the dictionary were found in the remotest mountain hamlets and among every class of the people. The dictionary has profited from the unrequited labors of no fewer than four hundred contributors. With all our boasted intelligence, the United States seems to be behind some other countries in respect to great dictionaries.

A WELL ALWAYS FULL OF ICE.—Near Brownsville, Minn., there is a natural ice well. On visiting it we found a shaft about twenty feet deep, and we could plainly see ice in it. We then visited a shaft a few feet distant, and

immediately upon entering it a cloud of steam, caused by the cold air coming in contact with our heated bodies, rushed forth. This shaft was excavated for the purpose of ascertaining if possible the cause of ice forming in the well, some persons believing in the theory of a large cave being connected with it. After reaching the depth of 100 feet without result drifting was abandoned. Before the shaft was made it is claimed that the well filled with ice to within six feet of the top. A thermometer marked 30° Fahrenheit. About six feet back from the mouth of the tunnel the floor and sides are in many places covered with ice. A strong current of air constantly flows from the excavation that is very perceptible 100 feet distant. With the thermometer at 90° an atmosphere below the freezing point is pleasant to contemplate, even though dangerous to investigate.

MALARIA.—President Chadbourne, of Williams College, is an expert in chemistry, especially in its relation to health. Malaria has recently appeared in Western Massachusetts, and its cause has been attributed to the mill-ponds, reservoirs, and drains, of various manufacturing. One company was indicted for maintaining a nuisance in the form of a sewer which polluted a river. Dr. Chadbourne was asked to "throw all the light possible on the subject." He says in reply that he used to teach without misgiving that the malarial poison producing intermittent fever was the result of vegetable decomposition, especially the decomposition caused by stirring soils rich in organic materials and exposing them to heat and moisture. He now thinks it was wrong, and that very little is known on the subject. "We do not know," he frankly admits, "whether the miasm is an inorganic gas, the vapor of organic compounds, or cryptogamic organisms. Nor have we yet learned what the specific conditions are that secure the production of the miasm, nor the means of its distribution. We have some facts and plausible theories on all these points, but no theory that I have heard of which accords with all the facts now known. Malaria abounds in wet and dry places, in valleys and on mountains. It appears in places where it has before been unknown, without any change of condition that can be seen." Dr. Chadbourne is convinced that moisture has nothing to do with it, because malaria abounds in the driest and cleanest parts of the Rocky Mountains; and, while he discards the old theories, he says that he has no new ones to offer.

THE LAST OF DR. HAZARD.

WE give herewith the conclusion of the correspondence with Dr. Hazard on Materialism.

We were in hopes that the Doctor might have been induced to continue the discussion, but he abruptly declined to write us another letter after receiving our third reply, as given herewith. He did, however, in pursuance of his intimation at the close of his last letter printed below, "review" *The Problem of Human Life* in his paper. But such a review! It absolutely consisted of an almost verbatim copy of his objections as given in his second and third letters; and that, too, after having received and read our replies! Of course, he makes no reference, in his "review" to the fact that his objections to the book had already been sent to the author in two letters, or that they had been effectually answered. He did not then suppose that this correspondence would ever see the light. His readers—many of whom take this paper—will now only have to read our last two replies to have a complete answer to the Doctor's so-called "review." Ed.

DR. HAZARD ON MATERIALISM.

ST. LOUIS, Jan. 22, 1881.

A. WILFORD HALL, ESQ.

Dear Sir: Your very kind letter of Jan. 18 is just received and read. I regret that you should deem it necessary to bestow so much time and labor upon my case, which really appears to be a very bad one! It appears to me that I must be guilty of gross ingratitude toward yourself. You have taken such pains to enlighten my defective understanding that you must regard me as truly an ingrate, by reason of my remaining unconvinced of the truth of your theories.

"Misery loves company." Hence you will not be surprised at learning that I feel comforted to find that I have some companions who regard your positions as untenable. Rev. Dr. Sheldrake, e. g., seems to me to have the best of the controversy in Chapter III. of your book.

I believe you are in error when you assert that odor "is admitted to be substance by the whole scientific world." A portion, at least, of the "scientific world" regards odor as a form of molecular vibration. The olfactory sensation, like others, can be evoked, by electrical irritation of the nerve at its point of distribution, in its course, or at its point of ultimate termination, (or origin) in the brain. Hence there is no need for the hypothesis of a special substance to be termed "odor."

You accuse me, as if I were a criminal, with having failed "to pay the slightest attention to this marvelous transition from density to rarity, in the material world," &c. Now, I submit that it is you, my dear Mr. Hall, who have failed to recognize the great gulf which appears

to be fixed between matter and force. You admit, in your reply to Rev. Mr. Sheldrake, that the refractory gases may be condensed into liquids,—you might have said solids,—that the most tenuous forms of matter can be weighed, measured, &c.; but, in spite of this, you still contend that there is an analogy between these *substances*, and light, heat, magnetism, &c.!

No one contends that the “material forces” are unreal; nor that the phenomena of life are not actual. But as to the *substances*—light, sound, magnetism, gravitation, life, &c.—there is a well-founded doubt. At least, it so appears to me.

I have no taste for hair-splitting discussions; neither have I the time. I will, however, take up, once more, our first “bone of contention”—material and substance being convertible terms in science. You say: “While all *wire* is *metal*, surely you would not teach that therefore all *metal* is *wire*. While all *material* is *substance*, it is a very different thing to assume that all *substance* is *material*.” Now you admit that “all *wire* is *metal*.” This, in its essence, assumes what we know to be true, namely, that all metal—all that human industry, through the ages, would be capable of drawing from the stores of Nature—*might be converted* by proper manipulation *into wire*. All forms of matter have certain characteristics in common. So, also, have the different forms of force. But there is no known means of condensing your hypothetical “substances” into anything ponderable. The analogy is at fault in one of its most important points.

The phenomena of magnetism seem to have impressed you greatly. But I nowhere in your book—which I have, as yet, only partially examined—find any allusion to magnetic *repulsion*. I presume you have some plausible explanation of the “threads on spools going by springs” which will help you out of the difficulty,—at least to your own satisfaction, even if it fails to satisfy those who are content to observe facts as they are, without formulating some fantastic theory to account for them.

I must formally protest against your presumption that force must be “absolutely *nothing*” so long as it is not regarded as *substance*. On the same principle the *motion* of the water-wheel is “absolutely nothing,” although it may give origin to all your “substances”—light, heat, magnetism, &c. If motion is a “synonym of nothing,” then “nothing” is the source of all your “substances” which are consequently created out of it. Had you not better go back to the Westminster Confession? As you have made such a radical change in your belief once, there will be no special inconsistency in changing back again! If I have misrepresented you (even to myself) I am truly

sorry for it; but if when the insect moving his legs (and “moves four solid miles of air”) sends his “corpuscular emanations” called sound in every direction for half a mile, more or less, does he not “create” these corpuscles out of nothing? And after they have traveled a half mile, more or less, are they not resolved into nothing? If this “substance” evolved out of nothing by our locust does not again become nothing, what does become of it? In the case of molecular vibrations (assumed) it is easy enough to account for their change into some other form of force; but by your hypothesis, for my own part, I can not see what is to become of these children of circumstance! The implication of your quotation from your book is, of course, that these hypothetical corpuseles “created” by the locust go on through space for ages,—eternity, for that matter,—continually getting more and more dispersed, until God in His infinite mercy sees fit to gather these wanderers into a “pellet,” or some other absurd destiny may be “guessed” for them! If you teach the indestructibility of your “substances,” you teach the other absurdity of creation of them out of nothing, for that is what it amounts to.

But enough of this. The remainder of your very kind letter could be answered in the same manner. Each of us would feel certain that his own logic overthrew that of the other; but *cui bono*?

If I review your “Problem” in my journal a second time, it will be only a short notice, with a few of the propositions, in your own words, followed by some remarks of my own, showing their untenability. I have no space in my poor little journal for any prolonged discussion of medico-theologico-scientific points. With your admirable command of language and casuistic way of presenting your ideas, you would soon furnish me with “copy” enough to keep me supplied with matter for its columns for a year. My less than two thousand readers would probably soon tire of an endless contention, which would, after all, amount to nothing. Therefore, I can not open my columns to the discussion. If you still demand a review, you shall have it; but—in his own paper the editor is a despot—you will have no chance to reply, unless you can get some other editor into the affray. If you do not care for such a one-sided affair, direct me to do so, and I will return the book.

Very respectfully and sincerely yours,

WM. B. HAZARD.

REPLY.

NEW YORK, Feb. 4, 1881.

Dear Dr. Hazard: I have the pleasure of ac-

knowledging receipt of your third letter. I am glad that you did not decide to "give up the ship," on receiving my last communication, but to make one more effort to extricate your hastily assumed positions upon substance, material, motion, force, &c., from the doom to which they are so justly and logically entitled. Step by step in my previous letters, I have endeavored to fortify the central position assumed in *The Problem of Human Life*, that all the forces of Nature were necessarily substantial, and thus to establish a scientific basis for the substantial or entitative nature of the soul or life-force which moves the molecules and organs of living creatures. I can only say that I am more than satisfied with the progress made in this correspondence, and I feel thankful that you have shown so laudable a disposition to prosecute it.

In your first letter you used *force* and *motion* as convertible terms. In your second letter you abandoned that position, as any scientific reasoner should have done, and made *force* the cause of *motion*, thus making them entirely distinct from each other. For example, in your second letter you make the *force of gravity* sustain the same relation to the falling water that the *steam* sustains to the moving piston. I quoted your own words, and applied your own logic, as you recollect, and thereby demonstrated that gravity must be as really substantial in bringing the water down as is steam in pushing the piston, or as is the steel spring in turning the wheels of the clock. You do not find it convenient in your present letter, to notice that argument, based as it was upon the irresistible application of your own words and logic. Instead of admitting its force, as a candid seeker after truth should have done, you silently ignore it, and try to divert your thoughts and mine from its crushing effect by a few faint attempts to weaken the force of my letter. I propose now to take up your entire communication in reply; and by piecemeal to meet every misconception, perversion, and even irrelevancy, it contains, and thus leave you without excuse.

Let me commence with your attempted reply to my illustration of the difference between *substance* and *material*, in which I refer to the manifest distinction between *metal* and *wire*. You think you discover a weak point in this illustration; and you hasten to seize upon it as a hungry trout snaps at the silken fly, not knowing that there was purposely concealed beneath this bait a very sharp hook with which to fasten its victim beyond the hope of release. Let me now uncover this hook, and show you how nicely you have been caught. To do so, I must re-state my argument and your reply,

thus: "All *wire* is *metal*, but surely you would not therefore conclude that all *metal* must be *wire*. In like manner all *material* is *substance*, but it is a very different thing to conclude that all *substance* must therefore be *material*." You reply, that as all *metal* is susceptible of being drawn into *wire*, therefore *wire* and *metal*, like *material* and *substance*, are "convertible terms!" Now, I was morally certain that you would make this very reply; and I purposely employed the terms *wire* and *metal* by erasing the word *substance*, as I first wrote it, and putting *metal* in its place! Suppose I had left it *wire* and *substance*, what reply could you have made? None at all. Let us now state it as at first written, and thus expose the point of the barbed hook. "All *wire* is *substance*, but surely you would not therefore conclude that all *substance* must be *wire*." Then notice the utter falsity and absurdity of your criticism: "As all *substance* is susceptible of being drawn into *wire*, therefore *wire* and *substance* are convertible terms." That is to say, as air, and water, and flesh, and wood, are susceptible of being drawn into *wire*, therefore air, water, flesh, wood, and *wire*, are "convertible terms!" You would hardly undertake to draw a block of sandstone into *wire*, though they are both substances! The nearest you will ever come to it is in your present argument, which turns out to be a "rope of sand!"

But taking the illustration as I sent it, your criticism, even then, is totally fallacious. Is it possible you can see no shade of difference between *wire* and *metal*?—and that, like your conception of *material* and *substance*, you regard them as "convertible terms?" Why, Doctor, the smallest boy that is permitted to attend a public school in Missouri would know better than that. Send such a lad to the store to get a piece of *wire*, and he would have too much discrimination in the use of words to ask for a piece of *metal*, though he would fully comprehend the fact that one was made from the other, and that both were *substantial*. And should the storekeeper give him a roll of sheet brass, under the impression, as taught by the editor of the *Clinical Record*, that *wire* and *metal* are "convertible terms," the common sense of that child would be insulted, and he would go home declaring that the merchant was either a lunatic or an idiot. The man who could honestly believe that *metal* and *wire* are "convertible terms," as a subterfuge for seeing no shade of distinction between *material* and *substance*, should be excused for thinking that the Rev. Dr. Sheldrake has "the best of the controversy" in Chapter III. of *The Problem of Human Life*.

We therefore come back to the original ques-

tion upon which our controversy commenced, and upon which materialism hinges, namely, are there *substances* in Nature above *material* conditions, or outside the domain of material existences? In other words, are there actual substances that can neither be weighed, nor measured, nor recognized by the physical senses? If so, then such substances may be fairly classed as *immaterial*. I answer that there are such substances, which will now be proven by the highest scientific authority, and finally by your own statements in these letters.

Observing the irresistible force of the argument based upon the substantial nature of *odor*, as amplified in *The Problem of Human Life*, you thought to blunt its edge by expressing a serious doubt of the fact that the whole scientific world admits *odor* to be substantial. Now, any irresponsible disputant might say the same thing of air; but what would such expression of doubt be worth, without quotations from standard authorities to sustain it? It would be worth just as much as yours. You quote no authority; and I strongly suspect that the "portion" of the "scientific world" to which you have reference, who regards *odor* as merely a mode of "molecular vibration," has the honor of presiding over the destinies of that "poor little journal" in St. Louis. But, on the contrary, I quote in the *Problem of Human Life* high authorities, such as Professor Tyndall for example, who teach unequivocally that *odor* is *substance*, and that the olfactory nerves "are stirred by the infinitesimal particles of the odorous body." (See page 40.) Can you offset these by other authorities equally high? I take the liberty of answering in the negative. But even if you could, it would be only arraying authority against authority, and thus aiding me in demonstrating their general unreliability. To show the absurdity of this desperate denial that *odor* is substance, I would ask, is it likely that Prof. Tyndall, the modern champion of *light* as a mode of motion, of *sound* as a mode of motion, of *heat* as a mode of motion, of *life* as a mode of motion, or, as you express it, "molecular vibration," and the general scientific godfather of all other kinds of modes of motion, would have deliberately admitted *odor* to be a *substance*, constituted of "particles of the odorous body," had there been any rational or conceivable way to convert it into another "mode of motion?" What a pity the editor of *The Clinical Record* had not stood at his elbow when he was writing his standard works on sound, light, and heat, as modes of motion, and suggested to him the important discovery that *odor* is not substance at all, and thus have helped him to sustain the materialistic position that all substance is ma-

terial, and that the soul and life are nothing but a puff of air, or mode of "molecular vibration"!

But *odor* being thus admitted to be substantial, you have one substance, at least, which can neither be weighed, nor measured, nor proved to have an existence by any chemical test known to science; and so completely removed is it from gross, material conditions, that even *you* are forced to take it outside of the material domain, and classify it as a mode of "molecular vibration" to avoid the absurdity involved in your view, that all substance is material, and that the two are "convertible terms"! Thus, by the testimony of the highest scientific authorities, my position is sustained. Your attempt to show that *odor* is but a mode of "molecular vibration" by the fact that the sensation of smell can be excited by electrical irritation of the olfactory nerve, is too weak a quibble to be indulged by a logical thinker upon scientific matters. The same thing is, of course, true of the *gustatory* nerve and sense of *taste*; but does this prove that the particles of *food*, by which the sensation of taste is normally excited, are not substantial? You would be forced to claim, according to your profound mode of reasoning, that the particles of meat and vegetables are not substance at all, but merely a mode of "molecular vibration"! Please read my analysis of the five senses, at the close of Chapter V., beginning at page 221, and you will see good grounds for admitting that all our sensations are fixed upon the same uniform and eternal plan of excitation, by the contact of real, substantial corpuscles.

But this reference to *odor* is only by-play in my argument, and not at all my conclusive proof as to the absolute existence of immaterial substances. Let me give you something that defies quibble. You have denied, in this correspondence, that light and sound are substantial corpuscles; and hence you must agree with Professor Tyndall and with the entire scientific world, that light is a mode of *etherial* motion, as sound is the motion of *air-waves*. But what is this assumed *ether* except substance?—though evidently it is not a material substance, since it can neither be weighed, nor measured, nor observed by any of the senses, nor shown to exist by any chemical test. Yet it is admitted by all physicists to exist as a real, immaterial substance, in order to sustain the *undulatory theory of light*, since manifestly there can be no *undulation* unless there be a real substance to *undulate*! This *substantial ether*, therefore, which is admitted to be substance by Prof. Tyndall (see pages 135, 165, 206, 223, of *The Problem of Human Life*), is demonstrably

not a material substance, since it circulates freely through the texture of the densest material bodies, such as diamond, glass, &c. Thus, by adopting the undulatory theory of light, you have yourself acknowledged the actual existence of an immaterial substance—*ether*!

But I do not need this inferential admission. You distinctly admit, in plain words, that *ether* is an immaterial substance. In your present letter, in order to disparage my position as to the substantial nature of sound, light, magnetism, and other forces, you say, "there is no known means of condensing your hypothetical substances into anything ponderable"; and hence you conclude that they are not substances at all! But is there any known means of condensing your "hypothetical substance" *ether* "into anything ponderable"? If not, then by admitting *ether* substantial, you have sustained my argument as to the substantial nature of sound, light, magnetism, &c., even though they cannot be condensed into anything ponderable. But these are not your strongest words in support of my position. I quote again from your present letter: "All forms of *matter* have certain characteristics in common." But what characteristic has this substantial *ether* in common with granite, platinum, and iron? None whatever. Hence it is not "*matter*," by your own unqualified admission! But being substance, as you also admit, resembling a "jelly" as Tyndall puts it, it is therefore an *immaterial substance*! And if *ether* can be a *substance* and not be *material*, so can gravitation, light, heat, sound, electricity, magnetism, and life itself; and thus your "convertible terms"—*substance* and *material*—have exploded by spontaneous combustion!

But driven to the wall, as you here find yourself, what are you to do? You dare not contradict Prof. Tyndall and the whole scientific world by repudiating the undulatory theory of light in order to get rid of this substantial but immaterial *ether*; for in that case you would be logically obliged to accept the hypothesis of *light* itself as *corpuscular emissions*, as was Sir Isaac Newton prior to the invention of this substantial *ether*! Truly the way of the scientific transgressor is hard. Please accept my sincere thanks for going back "once more to our first bone of contention."

In regard to *magnetic repulsion*, of which you find nothing in my book, you would not need to find anything if you could give the matter a moment's calm thought. You ought to see that if you can not *pull* an inert body toward you without some kind of substantial connection with it, then, of course, you can not *push* it from you without equally substantial

contact. As magnetism both *pulls* and *pushes* an inert body it must be clear to a philosophical mind that it can do neither except by substantial contact. The fact that magnetism performs these operations of pulling and pushing through impervious sheets of glass, the same as if they were not present, proves it to be an immaterial substance, just as "your hypothetical substance"—*ether*—operates through the same sheets of glass in order to keep up its etherial undulations, and thus produce waves of light. I feel sorry for you, and therefore will not press this matter further.

Having thus disposed of "our first bone of contention," and demonstrated by yourself that *material* and *substance* are not "convertible terms," I come now to other points in your letter which need correction. You insist that even if sound-corpuscles are indestructible after once generated, as the quotation from my book proved, they are, according to my view, *created out of nothing*, and you advise me to go back to the Westminster Confession, which inculcates that view. This looks like a wilful misstatement of my views, in order to aid a desperate argument. I hold and teach that sound-corpuscles, as well as light-corpuscles, can no more be generated out of nothing than can metal, wood, or water. This you must have known if you had paid any attention to my argument, unless you are absolutely incapable of understanding the simplest statements in a scientific discussion. I do not therefore set you down as a "criminal," as you charge me with doing in your letter. You may be innocent. The law holds no one to be guilty of crime who is not accountable. You ask what becomes of the sound-corpuscles after diffusion, or after we cease to hear them. This is a childish question. What becomes of odorous corpuscles, or the "infinitesimal particles of the odorous body," after we cease to smell them? They simply become diffused through the air till they lack sufficient concentration to affect our senses. You have the unhappy faculty of misconceiving almost every sentence you read in my book, and make me teach that sound-corpuscles travel on through space to all eternity, when I distinctly teach that sound, like electricity and odor, can not travel an inch farther than it has a suitable conducting medium. Hence, that it can not travel in a vacuum. You totally misapprehend the law of sound-conduction. For example, you speak of the sound of the locust as if the insect "sends" the pulses through the air. This is the old error of the wave-theory, in which Prof. Tyndall talks of the vibrating-fork "sending" off air-waves at a velocity of 1120 feet a second! If you will read pages 343, 344, *Problem of Hu-*

man Life, you will learn that sound-pulses are not sent off at all by the vibratory motion of the sound-producing body, but after being generated out of the substantial molecules of the sonorous instrument, they travel by a law of conduction and radiation somewhat analogous to that of electricity through a wire. You surely do not suppose that the electric fluid is sent through the wire 3,000 miles a second by the rotary motion of the dynamo-machine!

Again, you utterly fail to comprehend the meaning of *motion*. With your usual discrimination you insist that force can be *real* and not be *substance* as well as *motion*. Right here is a very fine distinction, which I believe has never been made in science; and in regard to which you will need to train your mind to very close thought. *Motions* are *phenomena*, and though *real*, are not *substantial*; while that which moves or causes motion must be *real substance*. *Motion* is the name we give to the act of a substance in changing from one position to another; hence, has no existence before the body moves, or after it comes to rest. But the force which causes this motion exists before the motion commences, and continues to exist after the motion ceases; and from this fact comes the so-called law of the "conservation of force," which its very framers cannot comprehend or make intelligible, except by making all force substantial. I show in the second chapter of my book that we cannot talk rationally of the "conservation" or preservation of that which has no substantial existence.

In consistent keeping with your misapprehension of the true meaning of *motion*, you try to render my position ridiculous by these words: "The *motion* of the water-wheel, which is absolutely *nothing*, gives 'origin to all your substances—light, heat, magnetism, etc.'!" I quote your exclamation-point, also; for I am as much surprised at the want of discrimination exhibited as you were at the supposed brilliancy of your hit. The truth is (and here another distinction new in science), *motion produces absolutely nothing*. It is not the *motion* of the wheel, or the *motion* of the water that produces these effects, but the *substantial contact* of the wheel with the machinery, rendered effective by the substantial contact of the water with the wheel, caused by the substantial contact of gravity with the water, which generates light, heat, magnetism, etc. You thus leave totally out of the account the real cause, namely, substantial contact; and show less discrimination in the use of words than did the Irishman who fell from the ladder, and on being asked if his fall had hurt him, he replied: "No; it was not the *fall* that hurt me, but the *lighting*!" He recognized the distinction between motion and

substantial contact, which I am here trying to point out, and which, if you could comprehend it, would answer most of your difficulties. We give names to many phenomena which, though real, as phenomena, are not substantial, such as darkness, cold, shadow, etc. In like manner motion, *per se*, being nothing substantial, can effect nothing in physics. For example, the piston of a locomotive might move with great velocity, and under a steam pressure of a hundred horse-power, but without substantial contact with the rail, no effect would be produced in moving the train.

I do not expect you to grasp this distinction. It would be asking too much, judging from the letters already received, and the incongruous manner in which you jumble together force and motion, cause and effect, substance and material, making metal and wire "convertible terms," etc. You add: "But enough of this. The remainder of your very kind letter could be answered *in the same manner*." I have not the least doubt of it.

You finally give me an intimation of what you expect to do when you come to "review" my book "*a second time*." Good gracious! Do you call that first notice a "review"? If a mere finger's length, falsely charging the author with materialism more ultra than that of Haeckel and Huxley, ending with an apology to your readers for taking up so much of their valuable space, can be dignified as a "review," then I comprehend your meaning, and shall know about what to expect when your review "*a second time*" appears. I did not need to be told that you were a "despot" in the editorial control of your paper. But I beg your pardon. I do not ask to reply through your columns to any "review" you may see fit to publish of my book. I can reach every one of your "less than two thousand readers" without that privilege. So you can proceed to review the book "*a second time*," and I will try to submit with all meekness to the "one-sided affair."

As to your suggestion about returning the book, I will only say, I would not accept of it if you did return it. But I do most earnestly suggest, if there is no probability of your making better use of it than you seem to have done thus far, that you pass it over to some friend who has the ability and will show the fairness to read it understandingly.

With much consideration, yours truly,
A. WILFORD HALL.

RELIGIOUS DENOMINATIONS.—No. 3.

THE CHURCH OF CHRIST (DISCIPLES).

DURING the first decade of the present cen-

tury, Thomas Campbell and his son Alexander came from Scotland to America, and inaugurated a reformation in the Protestant world that has been more widely and profoundly felt by all classes than any religious movement since the days of the Wesleys. Although of Presbyterian faith and education, they, by a long-continued and prayerful study of the New Testament, became thoroughly convinced that nothing but *immersion in water* is Christian baptism. They therefore, in 1812, united with the Baptists; and continuing the earnest study of the Word of God, and having tasted of the blessings of a free and independent search for the truth without the entanglements of creeds and other church standards, they were led on into other fields of thought that soon made their presence in the Baptist church disagreeable to many, and finally led to their virtual separation from that body in 1824. A few of the more important truths they claimed to have discovered in the Scriptures, and which arrayed the Protestant as well as the Catholic world against them, are the following:—

1. That all sects and divisions among the people of God are unnecessary, injurious, and sinful; and that all Christians should be one,—one in name, one in faith, one in a practical life, and one in ecclesiastical organization.

2. That Christians should drop all denominational and party names, and simply call themselves, as individuals, Christians, or Disciples of Christ; and, as churches, call themselves the Church of Christ, or the Church of God, as the Scriptures have it.

3. That to effect this union, all creeds and confessions of faith *held as bonds of union* should be given up, and *the Bible alone* accepted as the all-sufficient guide in faith and practice.

4. That the religious mysticism of the day—the sights, sounds, various apparitions, and even semi-miracles, held as almost necessary to conversion,—were the results of ignorance of the gospel-plan, where blessings were offered freely to every man who would believe and obey it. They constantly urged that faith comes by hearing the word of God, and that salvation from sin is for all who love God and keep His commandments; and that in Mark xvi. 16, Acts ii. 38, and elsewhere, any man may read the conditions on which he may be saved, without supernatural agency otherwise than through the Word of God.

These and other positions, assumed and defended with an energy and ability seldom equalled by the reformers of any age, elicited, as was natural, a long and persistent opposition; but it is now claimed by the leading writers of this church that the labors and

studies of a half century have wrought great changes in the Protestant faith and practice, most satisfactory and gratifying to the advocates of the newly-discovered truths; for now almost every religious party is advocating Christian union, while creeds and confessions, *as bonds of fellowship*, have lost much of their hold upon the most intelligent of all the churches; and the Bible, and it alone, is now urged in Sunday-schools, in the pulpits, in the religious periodicals, and almost everywhere as our all-sufficient guide.

Not only has this great effect, as they claim, been wrought upon most of the Protestant denominations of America who still cleave to their own organizations, but it is a fact of religious statistics that a multitude has been gathered into the body known as “The Church of Christ,” who have banded together as an organized body of collaborators to carry on this work to its completion, being assured that when all have fully learned the great lesson as taught by the apostles, the churches will virtually, if not formally, constitute the one grand “body of Christ” on earth.

Notwithstanding the efforts of Alexander Campbell to direct the attention of the religious world to the names “Christian,” “Disciple,” “Church of Christ,” &c., as the appropriate title for distinguishing God’s people individually and collectively, and the evil effect of man-made names, so common throughout Christendom, yet owing to the great talent and personal influence of Mr. Campbell in forwarding this movement, the denomination is now universally known as “Campbellites.” This people, however, repudiate the appellation; not out of any want of love for the great reformer, but alone on the ground that the New Testament warrants the use of no human name in speaking of the Church of Christ, or His individual followers.

As proof that the labor of these reformers and of their many and powerful coadjutors have not failed in convincing the people of the truthfulness of their plea, already more than 600,000 members are organized in the United States alone, not to mention Canada, England, Australia, and several other countries. The churches in America number about 5,000, and their ministers about 3,500. They own twenty-eight institutions of learning, embracing three universities, two orphan-schools for girls, and a number of colleges more or less endowed, and all or nearly all doing well. The money invested in lands, college buildings, and endowments, amounts to nearly \$3,000,000.

They have thirty-six religious periodicals, weeklies and monthlies, the most of which are published in this country; but two are pub-

lished in England, and one in Australia.

They carry on both home and foreign missions to a considerable extent. Besides endeavoring to establish missions in the weaker states and in some of the territories at home, they have missionaries in Jamaica, England, Denmark, Paris, and Constantinople. The work of missions is under the management of a General Convention, a Foreign Board, and the Woman's Board of Missions.

The church government is congregational, with itinerant evangelists sent out by State and General Conventions, whose business is to "set in order the things that are wanting" in the feeble and unorganized congregations. Upon the whole they are an aggressive body of Christians, arrayed against every form of doctrine they conceive to be unsupported by the Scriptures, ready and bold in debate, defending the inspiration of the Bible, the Divinity of Jesus Christ, his death, burial, resurrection, and ascension, for the salvation of the world, and his coming again to be the judge of the living and the dead. They hail with joy the evident and rapid approximations to New Testament faith and practice by most all Protestants; and still believe the day not distant when all shall be of one mind, and speak the same things to the glory of one common God.

THE LANGUAGE OF STONES.

THERE is a superstition which originated, it is said in Poland, with regard to the choice of gems for wearing. It is that the month of the nativity of every individual has a mysterious connection with some of the known precious stones. Hence the propriety, in the selection of presents, or for wear, of the adoption of those jewels belonging to the month which Fate is imagined to have made significant. To illustrate this, a person born in the month of January should wear garnet or jacinth,—those stones being understood to belong to their fated character to that month. Subjoined is the list for the year:

January—Jacinth, or Garnet. Constancy and fidelity in every engagement. February—Amethyst. Peace of Mind. March—Bloodstone. Courage and success in danger. April—Sapphire, and Diamond. Repentance and innocence. May—Emerald. Success in love. June—Agate. Long life and health. July—Cornelian, or Ruby. Forgetfulness. August—Sardonyx. Conjugal felicity. September—Chrysolite. Preserves from folly. October—Aqua-marine, or Opal. Misfortune and hope. November—Topaz. Fidelity and friendship. December—Turquoise or Malachite. Success and happiness in life.

MADE OUT OF NOTHING.

BY ELDER THOMAS MUNNELL.

THE author of *The Problem of Human Life* rejects the assumption of the Westminster Confession that this world and all material things were made out of nothing, and induces the Latin philosophy *Ex nihilo, nihil fit*—Nothing comes out of nothing. He maintains that as all things are "of God," "Of whom are all things," so all the elements of matter are but condensations of His "exterior nature," and not a product from nothing; that "physical organisms were condensed and framed out of that portion of God's omnipresent substance suited to such material existences: their vital parts out of a higher, finer grade of God's substantial nature; while the mental faculties and spirit were but drops out of the higher qualities of God's substantial intelligence and spiritual essence."

Admitting that the mental faculties and spirit were "drops out of God's spiritual essence," and not "attenuations" of the finer elements of *matter*, it still leaves the doctrine that electricity, magnetism, animal life, and all physical organisms are in the nature of "attenuations" of the grosser forms of matter; or, which is the same thing, that these organisms are but condensations of higher elements from God's own exterior being. Now, is the idea that "an immaterial substance can be transformed into a material body" unscientific and irrational? If immaterial substances cannot be "condensed" into the material, it is equally true that the material cannot be "attenuated" into the immaterial; and hence it has been objected with some force that attenuation of matter does not destroy the properties of matter; that if matter be preponderable, tangible, corruptible, and divisible, no degree of attenuation or condensation would, in such particulars, change its nature. But as true scientific ideas are often embarrassed by the imperfections of human language, I suggest that instead of the words "condensation" and "attenuation," we use the words, *synthesis* and *analysis*, and see if the above objections will have the same force.

While it is true that attenuated matter may still possess some, at least, of the same properties it had before, is it true that matter *analyzed* possesses the same properties? The air is attenuated as we ascend from the surface of the earth, and is homogeneous at all altitudes; but if we analyze it, are its elements homogeneous with the air? Do the oxygen and the nitrogen of the air, when set free, possess the qualities of the air when undecomposed? If atten-

uation is always responsible for homogeneity of substance, is analysis responsible for it also? Analyze water, and are its oxygen and hydrogen of the same nature as water, or but attenuated water? Are they alike visible, or ponderable, or do they taste like water? Or take light—white light—and decompose it, and why does no one of the seven colors in the least degree resemble the original white? Here, again, analysis is not responsible for homogeneity, of which chemistry will give us ten thousand proofs. Is not all material nature composite? and may not every substance be analyzed, no matter how gross, into higher and finer grades of matter?

Then as to *synthesis*, the process is simply reversed, and the evidence is the same. How it is that oxygen and hydrogen so shake hands, fill each other's interstices, and marry up each other's little infinitesimals, as to produce a *tertium quid* in the shape of water, so different from both, is a secret that lies deep in the unraveled arcana of God. But the great truth taught by this *synthesis* is the same as that taught by analysis—that it also is not responsible for homogeneity. The same is true when you throw oxygen and nitrogen back into air, and the seven colors into white light, namely, no homogeneity.

The above facts, running both up and down the scale, clearly show that *analysis* results in higher grades of matter, and that the elements of the coarser forms are of finer quality than the forms they compose. How this can be may be a mystery that will forever outfathom all our measuring-lines; and yet the fact itself is indisputable. As in the case of water-analysis into oxygen and hydrogen, if we had some powerful laboratory process by which we could analyze oxygen, analogy would evidently say that its elements, should it be found a composite substance, would prove to be of still higher grade, and equal, possibly, to electricity. Nor is it inconceivable that a still further analysis would discover elements equal to vital energy; and so on, till in thought we reach the hypothetical "exterior nature of God," from which elements may have been synthesized first into the finer, and then into the grosser elements of all the "physical organisms" in the universe, as well as all material existences. This view of the case certainly shows that the hypothesis that God evolved all things from Himself is not "unscientific," for it is only following out certain well-known scientific facts to their analogous ultimata, besides harmonizing with the Scripture, "For of Him and through Him and [back] to Him are all things."

But is it probable that God has any such

"exterior" nature as the hypothesis demands? Here the gates stand ajar but little; and yet we have a right to whatever hint may be found either in Nature or the Bible. And first we see in ourselves, made in the image of God (perhaps on the general plan of God's own organization), the "inner and the outer man"; and in the next world "we" are to have heavenly "tabernacles," and these "vile bodies" to be transformed like "Christ, our glorious body," and He is the "express image" of God;—from all of which it is rather probable that God is possessed of an "exterior nature"; and if so, the supposition that He synthesized the universe out of said nature is not absurd, nor as unscientific as that He made all things, material and immaterial, out of absolute nothingness.

Nor is there any more danger of Him wasting away His exterior nature by thus educating all material things, than there is of Him wasting His spiritual essence by becoming the "Father of all spirits" in all worlds. He that makes millions of suns to burn, for decillions of centuries for aught we know, with undiminished heat and splendor, without the least evidence to us of a supply of fuel for their wastes, is not likely to be embarrassed by the slight expenditure in creating all "things present and things to come" in any manner He may see proper. The fact that "the things which are seen were not made of things that do appear" (Heb. xi. 3) shows that all gross visible substances were composed or synthesized out of higher invisible elements which were all *substantive*, but in their highest and last analyses not necessarily *material*. And if gross matter loses one property after another by successive analyses, why might not the last analysis drop the last property of material substance, and reach the frontiers of "the exterior nature of God" required by the hypothesis before us, as assumed in *The Problem of Human Life*?

WHAT IS MAN?

THE SCIENTIFIC VIEW: THE SCRIPTURAL STATEMENT: WHICH?

BY REV. W. K. BOYLE.

It may be well to contrast the so-called scientific view of what man is, with the statements of Scripture on the same theme, and to appeal to man's own reason and consciousness for a settlement of the question.

Some of the leading scientists admit, with common people, the fact that man stands at the top of all known living creatures, being

pre-eminent for structure, for ingenuity to supply his wants, for something far beyond instinct, which we call mind, for foresight, and for large possibilities in the future. But when we come to consider his origin, and the path by which he has come to his present status, the much-learned ones tell us the following tale for truth, and in opposition to what they consider Scriptural fables. They say that there was a time far back in Eternity, a matter of a few billions of years more or less, when no life existed on our globe: there was nothing but matter,—in what shape and forms, however, we are not told. But at this vast remove, some discern in said matter the promise and potency of all life,—believing against all reason and fact that life can come from non-living matter. Others, more modest, do not discern but believe (that is, imagine) that a germ of life of some sort or other came floating to this world from some other planet, and so gave rise here in a bed of some sort or other of primordial slime to some sort or other of life, with the very faintest approach to organization; and that this nucleus began to aspire to definite form and completer organization, and that this formless mass of jelly lifted itself up by “natural selection and survival of the fittest” (two wonderful coadjutors, even less formless than said structureless jelly) to a higher form of life; and this higher form, by the continual aid of the two aforementioned coadjutors, moved by inherited instinct, developed a still more complex life; and that this process went on for untold ages, until the jellies became Radiata, and then developed somehow or other by aid of those two wonderful principles or laws, or whatever you call ‘em into Mollusks; and these in turn developed Articulates,—which, in progress of time, got a backbone, and became Vertebrates; and these, after a few more millions of years, advanced until, behold! we have a well-developed Ape, capable of an erect posture, and who indulged so much in a sitting position as to rub off his tail,—or, scientifically speaking, said tail became “aborted.” And still further progress put a better head on our apelike ancestor, bleached his skin, straightened his legs, shortened his arms, refined his hair in some places, and “aborted” it in others, and the “Cave-man” was the result; and his progress found its culmination in the historical Man,—since whose coming the two coadjutors above-mentioned have retired from the field, or gone off to some other planet just evolved from star-mist, and cooled down enough for the “jellies” to form, and to begin their scientific wiggling. They can not tell us when instinct ripped into reason, although they imagine it was somewhere in the apish

times; but this they do tell us, that mind is but a motion of matter, as heat is a mode of motion, &c. Bastian is said to assert that “there is no gap between sensory impressions coming in and motor impressions going out.” In this gap common people place the soul; but he denies there is a gap, and regards “all changes which take place as in harmony with the generalizations of chemistry and physics from phenomena taking place outside of the living body.” Very lucid! He is not as far advanced as the scientist, who, when asked, “What is matter?” replied, “Never mind.” And when further interrogated, “What is mind?” replied, “No matter.” The above-described man can’t have any God, as it is scientifically impossible; for the unknowable, the scientific God can not be known. To him, “death ends all”; for a resurrection is scientifically impossible. And according to this doctrine, man began to be, in slime; and ceased to be, in corruption,—feeding worms, and ending in impalpable dust.

And now what do we common people receive as truth on these questions?

After the earth had been fitted up for his abode, “God made man in his own image and likeness, out of the dust of the ground, breathing into his nostrils the breath of lives; and so man became a living soul.” Of one blood all the nations of the earth were made. Created man, unlike “evolved” man who is only matter, consists of body, soul, and spirit; has a consciousness of immortality, which the Scriptures make to him a certainty. Such knowledge develops the highest activities and the noblest ambitions; and man is being led thereby to a higher place of being, and is divinely assisted in his upward progress until he is “presented faultless before the presence of His glory with exceeding joy.” Mind is to him the vehicle through which the soul-life expresses itself; and transmits to his body, by a beautiful system, all sensations which are necessary for its health and activity. This man has a God, who has revealed Himself in the person of His Son, so that Godhead has become attuned to human vision and thought, and the Unknowable becomes the Known. Death is but a state of transition. There is a life beyond. There shall be for this man a resurrection from the grave; and there is promise of endless felicity in a spiritual body, whose capacities are enormously beyond our present reach, and each of which will be a channel through which joy will ever flow into the never-sated soul. In that life there will be infinite progress forever.

Which view recommends itself? One has Science for its author, and cannot be demonstrated as true. The other teaching comes

from God, and is attested by direct, internal, external, and collateral proofs, which, under the rules of evidence in a court of law, would secure us favorable judgment beyond question. It is universally admitted that thought moulds life and shapes character; and this is only another form of announcing Solomon's utterance: "As he thinketh in his heart, so is he." The men of the slime cannot go beyond their range, and earthiness is stamped on their life and character, and they must go back to dust, with whatever of judgment lies beyond,—while the sons of God will "with open face behold as in a glass the glory of the Lord, and shall be changed into the same image, from glory to glory, as by the Spirit of the Lord, and shall *live and reign forever* with Him."

Which?

SCIENCE AND CHRISTIANITY.

BY PROF. I. L. KEPHART, A.M.

It is too frequently the case that both the pulpit and the religious press arraign Science as being antagonistic to the Christian religion. Often are ministers, in their pulpit efforts, heard to say: "Science would have us believe there is no God; that the universe is the product of chance; that man was evolved from the monkey, and the monkey from the moneron; that there is no immortality,—no heaven, no hell; *but Science is false!*" or words to that effect. Now, the fact is, that Science teaches nothing of the kind; and all such assertions are but so many false accusations. Those who utter or print them, falsely arraign Science; and they do so because they fail to distinguish between Science proper and *false theories of Science*. Science, real and true, is one thing, and a theory of Science is another. A scientific *fact* is as much a truth of God as is the divine declaration that man must be born again before he can see the kingdom of God. But a theory of Science, based upon an imperfect knowledge of the scientific facts involved, is only a *theory*, and not by any means necessarily true, even though it be advocated by such eminent scholars as Spencer, Mill, Strauss, Kant, and Buckle; for when such men go beyond the absolute facts of Science, into the uncertain fields of speculation and imagination, they are as liable to err as are other fallible beings.

Science is knowledge systematized. Huxley says: "The *science* of any subject is the highest and most exact knowledge on that subject."

The science of the material universe is the most exact knowledge of the *facts* of the material universe and its laws, so far as they have been ascertained by investigation, observation, and experience. Hence, according to the generally received faith of believers, there can be no conflict between Science and Christianity, for both have the same author. The *facts* of the material universe are as much truths of God as are the moral obligations set forth in the Decalogue.

But all should be careful to distinguish between the *facts* of material science and the materialistic theories of atheistic scientists. The latter may be, and in many instances have been proven to be, false; but the former never. The latter, in many instances, conflict with and antagonize the doctrines of the gospel of Christ; but the former, when correctly understood, only tend to elucidate, beautify, and confirm those divine teachings.

Instead of arraigning Science as being antagonistic to Christianity, it should be set forth as being (as it truly is) the handmaid of that religion; for just in proportion as, by proper work and intellectual culture, men become more and more thoroughly familiar with the *facts* of Science, and the real spiritual nature of the Christian religion, the more clearly do they see the beautiful harmony existing between them,—the more readily do they perceive in the properties and functions of material nature the wonderful manifestations of the power and wisdom of that God who is clearly set forth in the economy of grace. This was the case with Sirs Isaac Newton, David Brewster, William Thompson, and John Herschel; with Professors O. M. Mitchell, Hitchcock, Dana, Louis Agassiz, Hugh Miller, Airey, Faraday, Mowery, and others,—who not only loved, read, and revered the Bible, but, great scientists as they were, spoke brave, true, and glowing words in defense of the Book of Books; and always discarded the idea that true Science teaches anything but what is in perfect harmony with the teachings of God's written word.

The best interests of humanity, as well as of the Christian religion, demand that care be taken to discriminate between the teachings of real Science and the pet theories of atheistic materialists, who, in their writings and discussions seek to elucidate, defend, and recommend their own peculiar views rather than to ascertain and explain the actual *facts* of Science. He is never a fair reasoner nor a safe authority who is more anxious to establish and defend a theory than to ascertain what is the fact. His zeal for his pet notion is most likely to befog his mind, warp his judgment, and close his eyes to existing facts.

EVOLUTION.

BY REV. M. STONE, D.D.

BEFORE evolutionists are ready to announce so radical a theory of the origin of the animate creation, as that it has all been evolved from a fleck of albumen, they are bound to assure themselves, and furnish sound reasons to their readers, for believing that transitions from one species to another are possible, and practicable; and they ought to show how these can be done. All the evidence we have upon descent, during nearly 6,000 years, goes to show that descent is only by natural generation, through the commerce of the sexes of the same species; or, at least, nearly kindred species. If uniform experience and observation ever justifies a confident conclusion, it would seem that 6,000 years of uniform examples in this direction would justify a confident denial of any other mode of descent, and throw the burden of proof—by argument or by facts—upon any one who should advocate any other theory. If a single specimen of living creatures in a state of transition could be found, it would be entitled to its due ratio of evidence against 6,000 years of examples of an almost infinite diversity of species in the other direction; and a sound reasoner would at once say it is hardly worthy of a moment's thought. But no such example has been furnished; and yet we are asked to believe that this whole host of living creatures have sprung from some fleck of albumen, moneron, or protozoan, by "natural selection" and "the survival of the fittest,"—if they can tell us what they mean by natural selection, without intelligent choice.

If descent, then, is by natural generation, we must encounter an insurmountable difficulty in the way of transition from one species to another in the stubborn fact that the *organs of generation* and the *sexual and parental instincts* of different species are so entirely different as to make transition from one order of beings to another incredible and practicably impossible. There is absolutely no sympathy between many species of the same order: as for example, the oviparous—fishes, reptiles, and birds,—no sexual attractions, no similarity of organs, no common ground for contact; but, on the other hand, we find natural repulsion, instinctive fear, or enmity.

If the doctrines of evolution may be applied to animal life, then certainly they may be to vegetable, an inferior order; and here we are met by a similar difficulty, arising from the diversity of the vegetable organs of propagation. There are no two vegetables whose organs of propagation are so nearly similar

that they can fertilize each other. The pollen of no two plants tested by the chemist or the microscopist is found to be identical; nor is the arrangement of the organs of any other plant adapted to receive the pollen of any male plant but of its own species. Admitting for argument sake, the possibility of Evolution, and the immense periods of duration which are supposed to be required to complete the process, we shall find our way hedged up by another set of difficulties equally as formidable as those of the sexual organs and instincts.

Transition from one order of being to another often involves a complete change of appetite, and masticatory and digestive apparatus. How is this creature to live during all this long period of change?

In passing from aquatic life to air-breathing, there is not only a total change of appetite, and masticatory and digestive apparatus, but the breathing apparatus and the blood; and it may be to take on legs and wings. What a hungry time such an animal must have for a few thousand years, while taking on these rudimentary appendages; and what an awkward figure a fish must make in trying to navigate in water with feathers and wings, and at the same time gradually losing fins and tail; and instead of making a long journey from salt water to some shallow river or brook of fresh water to deposit its spawn, to be left without care,—soon, prompted by a new instinct, to make a nest and deposit one egg a day, that must soon be brooded for days or weeks, before the offspring could be delivered from the shell; and then cared for and fed,—a duty of maternity never dreamed of before! Surely the evolutionists must do something to help us over these difficulties, or excuse us from accepting their theory, compassed by so many.

If hybrids were ever fertile, we could surmount these difficulties more easily; but as there is no well-established fact showing that of the very few hybrids any one has ever produced offspring, we can not see how we are to find any basis of faith in transitions from one order of beings to another.

FUTURE WATER-SUPPLY OF CITIES.

THE advancing progress of this age of civilization demands something better and more conducive to the health of our great centers of population than the present foul system of obtaining water from the drainage of large tracts of country. Few cities (if any) have a better or purer supply of water than New York, through her Croton Aqueduct,—yet, if the consumers of this delectable fluid who never

leave their palatial residences far enough to cross Harlem River, could visit Croton Lake and the watershed that supplies it, they would never drink another tumbler of this water, without having it well filtered and doubly strained; and even then, considering the barnyards and cowfields drained into this lake, the water would be sipped under mental protest. We have a heavy cloth filter upon the faucet from which we drink, and in two days' time this sack is half filled with living, crawling monsters, many of them half an inch in length, which could be easily seen by the naked eye, in a tumbler of water, but for their transparent character when fresh from the Croton pipes. Their confinement in the filter, part of the time dry, as when the water is not running, kills them, and causes their bodies to turn opaque. If any housekeeper in this city wishes to prove the truth of what we have said, let her adopt the filter here indicated, tied firmly over the mouth of the kitchen faucet, and she will never again make tea or coffee of unstrained Croton-water.

The old notion that water purifies itself, however filthy, by running over three smooth pebbles, has long since been exploded. Even the city supplies taken from large rivers—as those of Cincinnati, St. Louis, and Pittsburgh—contain the same foul ingredients (only a little more diluted) washed from ten thousand barnyards, pigstys, manufacturing nuisances, and even the entire sewage of all the cities above, and which line the banks of these streams. Chicago has the best system, probably, in existence, provided her tunnel were extended out four or five times farther into the lake than it now is; for it has the advantage that the drainage of the surrounding country is diluted by the enormous body of water constituting the whole of Lake Michigan.

The problem of the future supply of our sea-board and river-front cities with pure water, is one that has puzzled philosophers and civil and mechanical engineers; and which we believe will only be solved when the mode of drilling artesian wells shall have been so cheapened and improved that these pure fountains from the interior of the earth shall line our streets as thickly as lamp-posts do now, unless the magnitude of their supply shall require a less number. There is manifestly no certainty in the permanent purity of the water we drink till it shall come to us directly from a subterranean source beyond the reach of the poisoner, and the natural nuisances to which all surface supplies are liable.

THE TAILS OF COMETS.

PROF. ENNIS, of the Naval Observatory at

Washington, believes that the tails of comets are electric light. "If these tails had any substance," he argues, "the laws of motion are constantly violated by them. The great comet of 1843 went so near the sun that it passed from one side to the other in a few hours. Its immenset ail, 100,000,000 miles long, was shifted completely, so that it pointed directly in an opposite direction. Could that be so if it were composed of any substance? Could a comet swing 100,000,000 miles of tail around so quick as that? The electricity is generated by evaporation. As the comets approach the sun, the heat becomes more intense, the evaporation and accumulation of electricity more rapid, the repulsive force greater, and the tails longer. Sometimes the material becomes completely evaporated. Then the comet has no tail."

OUR EDITORIAL WORK.

WE owe to our readers—especially those of an unscientific turn of thought—an apology for the amount of space occupied in the present number of *The Microcosm* with the "Sound" discussion. We are involuntarily led into this discussion owing to the revolutionary character of the position assumed in *The Problem of Human Life* upon this subject, which has led to critical attacks upon such a radical departure by scientists from various points of the compass. Many honest and intelligent persons have wondered and asked what has the question of *sound* to do with the great matters involved in the problem of human life, religious philosophy, or the fundamental questions growing out of atheistic materialism? We think it has much to do with this entire field of investigation. Rev. Dr. C. H. Balsbaugh, one of the profoundest thinkers and most careful reasoners of modern times, declares in an article published in *The Gospel Preacher* that the entire philosophy of human immortality and the true key to the materialistic controversy of the nineteenth century are to be found wrapped up in the fifth and sixth chapters of *The Problem of Human Life*,—which are, as many of our readers know, devoted exclusively to the discussion of the nature and phenomena of sound.

In our original investigation of the laws and forces of Nature, we were driven to the conclusion that the basis of materialistic philosophy rested with its roots deep down in the scientific delusion that the natural forces were but so many "modes of motion," and that the conception of their entitative or substantial nature had never entered the minds of modern philosophers. From the prevailing view that these so-called natural forces were but modes of

molecular vibration have really grown up all the different corporeal systems of philosophy of this country and Europe, and which in one form or other have given direction to modern scientific thought. The system of philosophy which makes nothing substance save that which can be demonstrated to have a material basis,—that which can be weighed, measured, or subjected to chemical analysis,—forms the basis of modern materialism which has its roots in spontaneous generation, its trunk and branches composed of evolution, its leaves and fruit avowed atheism, with death an eternal sleep. In harmony with this materialistic trend of thought the physical science of our schools has been gradually shaped and established, till every law, force, or principle in Nature's realm is now taught as some kind of a "mode of motion," with nothing in the universe really substantial save the tangible bodies which come under material conditions,—while young men who receive such instruction go home to fill the various walks of life and learned professions, firm believers that sound, light, heat, gravitation, electricity, magnetism, &c., are mere insubstantial names for "modes of motion," which they do not and cannot comprehend. They simply know that the text-books so designate them, and that great scientists so teach. From this view of the natural forces, as taught by professors of physical science, it is but a short step to Haeckel's logical conclusion that the soul or life-force which moves our bodies is also a "mode of motion"; and that when the molecules of the brain and nerves cease to act, and the bioplasts stop their motion, the soul ceases to exist. What other logical conclusion can be drawn from current science? Hence materialism stalks defiantly through the land, with the majority of scientific students as its advocates. Young men learn it in their lessons of physical science, and teach it in their homes to their associates. They imbibe it from every page of their text-books on light, sound, heat, electricity, &c., and they only have to glance at the books of Haeckel, Huxley, and Tyndall, to see that logically the soul is no more an entity than is gravitation, sound, or light, but merely another "mode of molecular motion." Clergymen, too, without studying physics, absorb the same notions of the natural forces by association with students in that department, and never think of questioning this general sentiment of the scientific world, namely, that everything that is not a material or physical entity must be a mode of motion. Hence their logic fails them in the conflict with materialism. They go all to pieces, and hopelessly break down when they fall into the hands of a shrewd follower of Haeckel, who

takes their forced admissions on sound, light, heat, electricity, and gravitation, out of their own mouths, pins them to the fatal wall by unanswerable analogies going to make the soul and mental powers but additional modes of motion, and on the very same plane of reasoning. The minister thus flooded by the irresistible logic of scientific scholasticism falls back upon the Bible with an indefinable dread of science and a half-despondent conception troubling his dreams that there is a mortal conflict—an irrepressible antagonism—between Nature and religion, between the facts of science and the claims of revelation.

Here is just where we found the scientific and religious world but a few years ago. We saw clearly that to break this spell of materialism the first essential step was to revolutionize physical science, if it could be done, by successfully attacking this prevailing belief that the forces of Nature, instead of being real substantial things, were only modes of motion. To do this effectually we saw that some one representative so-called "mode of motion" must be selected as the battle-ground, and assailed with heaven's artillery of scientific truth. Which one was it best to select? We could have taken light, heat, or electricity; but we could not take all at once and do the work thoroughly, exhaustively, without making the book too voluminous. We therefore selected *Sound* as the least likely to be regarded as a substantial entity of all the natural forces or so-called "modes of motion," and more especially did we select it because sound was universally conceded to be but the self-evident motion of air-waves, and, as a demonstrated theory, had never been called in question by any physicist, ancient or modern. We believed then, as we believe still, that if this one distinctive or representative "mode of motion" could be fairly broken down, the others would have to follow, and with their destruction materialism would inevitably totter and fall to its death; for who would dare to deny the substantial or entitative nature of the soul, or think of doubting that the life-force which moves our molecules, bioplasts, and muscles, was a real entity on rationalistic grounds, after sound should be demonstrated to be a substance by the analogies of Nature, and the hopeless overthrow of the wave-theory?

Here, then, reader, is where you find us now in a veritable battle, and by these presents you have our apology for the apparently undue prominence given to the sound-discussion in these pages. We believe that every effective blow we are enabled to strike at the current theory of sound, we advance thereby one step nearer to the final catastrophe of the prevail-

ing materialistic philosophy of Europe and America, and one step nearer to the final proclamation by the angel of truth that the God of Nature is also the God of the Bible.

SOUND.—MAGAZINE EXPLOSIONS.

AMONG the errors taught for science in our colleges, none, perhaps, are more glaring than those which relate to the effects of magazine explosions in breaking windows at a distance. Writers on Sound, even in our standard textbooks, innocently refer the student and teacher to these destructive effects in illustration of the inflection and concussion of "*sonorous waves*," taking for granted that the condensed air-waves which produce these concussive effects, miles away from the source of the explosion, are the veritable "sound-pulses" which are heard at about the same time. These writers on acoustics have not as yet, even surmised that the condensed air-wave which breaks windows at a distance is one thing, and the accompanying "sound-pulse" is quite another; and that the two have no kind of relation to each other, save the mere fact that they occur so nearly simultaneously that the ear can recognize no interval between them. This manifest want of discrimination on the part of our greatest physicists, in discussing the wave-theory of sound, was one of the first things which led the writer to doubt the truth of the current theory of acoustics. He was led involuntarily to conclude, while reading these learned treatises, that, if such a radical misconception could be formed and inculcated for science by the greatest living writers and lecturers in illustrating the wave-theory of sound, then might not the theory itself be erroneous, from its foundation up? Here is an example in one of the passages which helped to make this impression upon his mind, and from no less distinguished a source than Professor Tyndall himself:—

"The most striking example of this *inflection* of a *sonorous wave* that I have ever seen was exhibited at Erith after the tremendous explosion of a powder magazine which occurred there in 1864. The village of Erith was *some miles distant* from the magazine, but in nearly all cases the *windows were shattered*; and it was noticeable that the windows turned away from the origin of the explosion suffered almost as much as those which faced it. Lead sashes were employed in Erith church; and these being in some degree flexible, enabled the windows to yield to the pressure without much fracture of the glass. Every window in the church front and back, was bent inwards. In fact, as the *sound-wave* reached the church it separated right and left, and for a moment the edifice was clasped by a *girdle of intensely*

compressed air." — *Lectures on Sound*, p. 23. Quoted and commented upon, p. 103, *Problem of Human Life*.

We could quote many similar passages from other writers, but this gives their general drift, — unmistakably teaching that the "girdle of intensely compressed air" which "clasped" this church and broke windows, was the veritable "sonorous wave" which was heard at that explosion, and by the people of Erith. It is perfectly clear that no other idea of the nature of this phenomenon had a place in Prof. Tyndall's mind, or he could not have so erred in the use of words as to call this "girdle of intensely compressed air" a "sound-wave." Look at its prodigious absurdity. If it were a "sound-wave," at this church, "some miles distant" from the origin of the explosion, then it was also a "sonorous wave" one hundred feet distant from the magazine, where, as a historical fact, it shattered a building, scattering its fragments over acres of ground! There is no escape from this conclusion. If Prof. Tyndall is correct in his exposition of the wave-theory, that it was really a "sound" or "sonorous wave" which broke the windows at Erith, then the wave-theory must teach that it was the "sound" and nothing but the sound of this explosion that killed men and horses at the same time nearer to the magazine, and scattered their disintegrated fragments over acres of ground, because it was manifestly the very same condensed wave or "girdle of intensely compressed air" which produced both of these destructive effects, only the air was naturally more intensely compressed near to the magazine than after it had expanded, by traveling miles away, growing weaker "as the square of the distance." Does Prof. Tyndall or any other advocate of the wave-theory really believe that a "sound" is capable of killing a horse and tearing it into a thousand pieces? As a simple scientific inquiry, propounded without reference to the peculiar teachings of the wave-theory, he would laugh at its absurdity and at the silliness of the interrogator. Yet as an advocate of this theory, as it is illustrated by the effects of ordinary air-waves, he himself tells us that this same sound-pulse or sonorous wave which broke windows at Erith, actually tore a horse to fragments and scattered the timbers of a building for a distance of more than a quarter of a mile, since that same "girdle of intensely compressed air" which did this destruction nearer the magazine, when it had reached the village of Erith was nothing but a sound-pulse or "sonorous wave" which broke the windows of the houses!

As the eminent physicists who have written upon this subject seem unable to comprehend

the real nature of the phenomena involved, let us try, if possible, to untangle the problem for them. The true cause of the misapprehension on the part of Prof. Tyndall is evidently that he fails to observe or to take any account of the fact that at a magazine explosion tens of thousands of cubic yards of gas are instantaneously generated and added to the air, and that this sudden addition of gas, occurring at the same time as the sound-report, drives an intensely compressed air-wave away at the same instant and nearly at the same velocity as that of sound, which tends to mislead superficial observers, and causes them to mistake the concussive shock produced by this addition of gas for the sonorous pulse itself which they hear at about the same time they feel the shock. These investigators seem never to have thought that a sound, however intense, if unaccompanied by an addition of instantaneously generated gas, *produces no concussive shock whatever, even when the observer is within a few feet of the sound-producing body.* As a conclusive proof of this, we refer to the most deafening sound ever heard, namely a peal of thunder as it sounds to the inmates of a house when the electric bolt strikes the building. So intense are such sounds as frequently to paralyze the tympanic membrane and cause total deafness. Yet as no gas is generated or added to the air at the time of such report, no concussive shock is felt, and not even a pane of glass is cracked in the very building thus struck by lightning, unless it is broken by splinters hurled from the path of the bolt in its passage through the building. Why? Plainly the answer is, because such report is purely a *sound-pulse* and not an *explosion*; and hence, as not a cubic inch of gas is added to the air, therefore it sends off no condensed wave or "girdle of intensely compressed air" to shatter windows at a distance, or even in the building struck by the bolt. It is true, we often hear and feel the windows of a house jar by the sound of distant thunder; but this is clearly the effect of *sympathetic vibration*, as fully set forth in *The Problem of Human Life*, some part of the house being tensioned or *tuned* to the vibrational number or exact *unison* of that particular tone, just as the sound of one string, by sympathy, will excite vibration in another of the same pitch. To show that this is the real cause of such tremor, it is an observed fact that other peals of thunder, vastly louder but of a higher pitch of tone, produce no effect upon the same house. Such jarring effects of distant thunder-peals manifestly, therefore, are not caused by girdles of compressed air, or otherwise every pane of glass would be shattered by the condensed air-wave in a house

struck by lightning, whereas not a sign of such concussive shock is felt nor its effects witnessed, notwithstanding the most terrific sound ever heard by mortal ears fills the building. How plain and simple, therefore, is this explanation of the effects of magazine explosions; and how consistent and every-way in keeping with the true theory of sound-phenomena!—And how utterly opposed is this true solution to the current view of sound, which requires the existence of "atmospheric condensations and rarefactions"; and in order to get them is forced to lug in the condensed air-waves caused by the instantaneous generation of powder-gas at a magazine explosion, and then to christen them "sonorous waves" and "sound-pulses" to make them harmonize with the theory!

Suppose Prof. Tyndall to be in a fort with one of his young students who knows nothing about gunnery or the bombardment of fortifications in time of war; and suppose a hundred-pound shell from the enemy's battery should crash against the walls of the fort, accompanied by a deafening sound. What would this learned physicist say to the boy, who might naturally suppose and so express his ideas, that it was the "*sound-wave*" itself which had broken the walls of the fort and scattered the fragments at their feet? The boy distinctly heard the sound, but not seeing the shell, superficially supposed that it must be the "sound-pulse" which had thus shattered the walls! Prof. Tyndall would of course set him right; but in doing so would explode the shallowness of his own teaching in regard to the destruction of the church-windows at Erith, since the air-wave which crushed them in was as veritable a *shell* or *missile*, and as separately distinct from the "sound-pulse" which the people of Erith heard, as was the metal *shell* which shattered the fort, and which this student of Prof. Tyndall's logically and scientifically supposed to be nothing but the sound of the cannon! If this student were sharp enough, he could make a stinging retort upon the Professor, after receiving the true explanation of the shattering of the fort: "Why, Professor, you must be mistaken. You told us in your lecture the other evening that the windows at Erith were smashed by a *sound* originating miles away, without any missile whatever being sent from the exploding magazine; and if a single 'sound-pulse' could do that, why might not the sound of a cannon fired at a distance break in a fort without the use of a metal shell?" We fail to imagine what reply the Professor could make! It really seems that the children of the rising generation will yet be compelled to come upon the stage and teach physicists

the first principles of mechanical philosophy and common sense!

To prove to the satisfaction of acousticians that the *sound* of the exploding magazine had nothing to do with the breaking of the windows at Erith, they have only to try the simple experiment of exploding the same quantity of powder scattered loosely over the ground (not confined, as in a magazine), and they can depend upon it, that while the crash produced by the condensed air-wave at the distance of Erith will be precisely the same (the quantity of added gas being identical), *no sound whatever will be heard in the village except the sound of the shattering glass!* If professors of physics in our colleges and universities will still insist upon the correctness of the wave-theory of sound, as taught in standard text-books, let them club together for their own enlightenment and purchase a couple of tons of powder, and thus satisfy themselves of the absurdity of the current theory by the above simple experiment. They will thus learn the real difference between a sound-pulse and a condensed air-wave.

Further, we assert here, as we have done elsewhere, that such an experiment, properly made and with suitable instruments, will demonstrate another thing equally conclusive against the views of acousticians, namely, that the condensed air-wave from an exploding magazine will travel at a very different velocity from that of the *sound-pulse* caused by such explosion; and that while it may, and no doubt will, outstrip the velocity of the sound at the start, or for the first couple of miles or so, (depending on the quantity of powder), it will surely fall behind in the end, and reach a distant station some seconds behind the report! We fully realize the risk to one's scientific reputation in thus predicting definite philosophical results in advance of actual experiments; but we venture it here without the fear of consequences. Let acousticians who wish to convict us of a want of scientific perspicacity go to the expense of a practical test, as here suggested, and we have no hesitation in promising them that the foregoing prediction will be substantially verified; and that while the *sound* of the explosion will travel with one uniform rate of velocity from the start to the limit of audibility, the condensed air-wave will start off with great velocity, but will lessen in speed more and more as the "girdle of intensely compressed air" expands and becomes less and less compressed till it will finally die out in the distance, and travel, probably, *no faster than a man can walk!* If it should turn out, as here forecast, that the sound-pulse and the atmospheric shock produced by such a test-explosion

shall reach distant stations at different intervals of time, then no one would doubt—even Professor Tyndall—the erroneous character of the current system of acoustics. We are anxious for the foregoing test to be made, and trust that students of science will not neglect to impress its importance upon the attention of professors of physics till some action shall be taken with that object in view.

In the next number of *The Microcosm* we will treat the reader to an exposition of Prof. Tyndall's experiment of the "tin tube," and show up his laughable exploit of *blowing out a candle by a sound-pulse without any air passing out of the tube!*

"A SORRY ILLUSTRATION."

WE have rarely been more interested, not to say amused, than in reading an editorial article under the heading quoted above in *The Christian Standard*, of Cincinnati, O., Sept. 3. Bro. Errett has really ventured to try his hand at science, and has gravely undertaken to criticise our "Challenge to Scientists," published in the preceding number of this paper, on the decrease of sound-intensity as the square of the distance. To make sure that he had fairly caught our idea, and that he did not misrepresent us (for there is no squarer man living than Bro. Errett), he first quoted our exact words, namely, that the wave-theory "teaches, as one of its fundamental laws, that the intensity or loudness of any sound diminishes as the square of the distance from the center, the same as the quantity of air increases. *That is, at two feet from the sounding instrument the sound is but one-fourth as loud as at one foot from it,*" &c. He then ventured into what we call deep water, as the reader will soon see. First, we will copy his entire criticism for the reader's inspection:—

"We take the liberty to italicise a sentence above, which we think *altogether misrepresents the law of the transmission of sound, according to the wave-theory (or any other, for that matter.)* It is true, we believe, that '*the intensity or loudness of sound diminishes as the square of the distance from the center, the same as the quantity of air increases.*' This rule does not determine *how much* sound decreases, in any case; but at what ratio for different distances, in all cases. That is to say, *if it diminishes a certain amount in going one foot, it will diminish four times that amount in going two feet.* But we never understood the law to mean what *The Microcosm* teaches, namely, that the sound diminishes absolutely as the square of the distance. A fair illustration of the law would be something like this: Represent the 'intensity or loudness' of the sound by some figure, say 100. Then, if this sound in traveling one foot lose one part in the hundred, so that at the end of that foot it has an

'intensity' or loudness of 99; then in going two feet, the loss of sound will be represented by the square of the distance or 4, and at the end of two feet the sound will be represented by 96—or 100 less 4. Or, in other words, the law indicates the *relative* decrease of sound, not the *absolute*. That can never be determined by any law.

"Gravitation acts on a similar law, but what a ridiculous example it would be to say that a body which weighed a hundred pounds at one inch from the earth, would only weigh twenty-five at a distance of two inches, and would weigh 400 pounds at a distance of half an inch! Yet this is as reasonable an interpretation of the law concerning gravitation as that of *The Microcosm* is of that concerning sound.

"To apply the law in either case, you must first have a *unit* of measurement; that is, you must know *how much* the attraction or sound diminishes in a *given distance*. Then apply the law, and you can determine it for any other distance.

"We must also be allowed to say that *The Microcosm* reflects too severely on the intelligence of the public in putting forward such an example as a fair illustration of the law. There are not many who pretend to be scientific men; but there are very many who do not care to be treated as if they had no scientific knowledge whatever. *The Microcosm* is really too hard on us."

We have a few brief comments to make upon this criticism. In the first place we assert, and will now prove it, that Brother Errett is entirely mistaken as to the teaching of science in regard to the meaning of this law of decrease in sound-intensity as the square of the distance. He distinctly charges that we have misrepresented science as taught in our colleges and standard school-books, and that no theory teaches that a sound at two feet from the instrument is but one-fourth as loud as it is at one foot from it. We repeat that this is exactly what Prof. Tyndall teaches, and what all authorities on acoustics teach, or their language has no meaning. Let us see if Brother Errett can give any other possible interpretation to these words of Prof. Tyndall than what we have given:—

"You have, I doubt not, a clear mental picture of the propagation of the sound from our exploding balloon through the surrounding air. The wave of sound expands on all sides, the *motion* produced by the explosion being thus *diffused over a continually augmenting mass of air*. It is perfectly manifest that this cannot occur without an *enfeeblement of the motion*. Take the case of a *shell of air* of a certain thickness, with a *radius of one foot*, reckoned from the center of explosion. A shell of air of the same thickness, but of *two feet radius*, will contain *four times the quantity of matter*; if its radius be *three feet*, it will contain *nine times the quantity of matter*; if *four feet* it will contain *sixteen times the quantity of matter*, and so on. Thus the quantity of matter *set in motion* augments as the *square of the distance* from the center of the explosion. *The intensity or loudness of the sound diminishes*

in the same proportion."—*Lectures on Sound*, p. 10.

No man it would seem, ought to misconceive these words. As sound is nothing but the "*motion*" of the air, according to the wave-theory, of course, when this "*motion*" is diffused throughout the shell of two feet radius, which contains "four times the quantity of matter" that a shell of one foot radius contains, the "*motion*" must necessarily be but one fourth as strong in the large shell as in the small one. How it is possible to misunderstand this teaching is a mystery. Bro. Errett calls such a decrease "*ridiculous*." We agree with him heartily; but that does not prove that the wave-theory does not teach it. The whole theory is ridiculous and absurd, from this foundation-law up; and if Bro. Errett will find one standard authority anywhere, living or dead, that gives his interpretation to this law of sound-decrease as the square of the distance, or any other interpretation than the one we have given, as justified by the words of Prof. Tyndall, we will gladly publish it in *The Microcosm*, and make a handsome acknowledgement. Hence, before he ventures to intimate, as he has here done, that *The Microcosm* reflects too severely on the intelligence of the public by making the teaching of the wave-theory so "*ridiculous*," he ought in fairness to be able to quote some book, ancient or modern, that gives his interpretation of this law, and not put his own understanding of the law forward as a text-book.

To prove that we understand the meaning of this law as all scientists understand it, we have recently had several newspaper controversies with professors of physical science upon minor questions connected with this law, notably in *The Apostolic Times*, and also with Prof. Humphreys, of Vanderbilt University, in *The Central Presbyterian*; and in no case have such professors questioned our interpretation of this law, but, on the contrary, they have elaborately carried on the same interpretation, and labored (unwittingly, as Bro. Errett thinks), to defend it in trying to refute points we had purposely left open as traps to decoy them into these very confessions,—knowing that the absurdity of the law itself would ultimately bring the wave-theory into contempt. Take our correspondence with Prof. W. A. Noyes, of Johns Hopkins University, as given on page 3 of the Sept. *Microcosm* from which Bro. Errett quotes. He not only admitted the law to be just as we have explained it, but he quoted from a standard text-book a common illustration, such as professors employ with their classes, to prove that this law, as "*ridiculous*" as Bro. Errett thinks it, must be correct. Here is the quota-

tion he sent us from a standard authority employed in our colleges:—

“Procure means of producing five sounds of exactly equal intensity; for instance, *bells* of the same kind, struck by hammers of the same weight, falling from equal heights. Place *four* of the bells at 20 yards and one at 10 yards from the hearer, and it will be found that the intensity of the sound from the one bell will be the same as that from the four bells struck simultaneously.”

Of course the same would be true with feet or inches as the unit, instead of yards, if there be any truth in the law. Hence, exactly in accordance with our interpretation the wave-theory teaches that the sound of the bell decreases “absolutely” as the square of the distance the same as the quantity of air to be put in motion increases, since the one bell ten yards, ten feet, or ten inches away from the hearer, is declared by this standard authority to be as loud as *four* such bells would be at *twice* the distance. Can anything be made plainer than this? We admit with Bro. Errett that such a law is clearly erroneous; and even, as he puts it, “ridiculous” whether applied to gravitation or sound; but it is going a little too far for him to charge us with misrepresenting a so-called law of science just because “we [he] never understood the law to mean what *The Microcosm* teaches.” It is not what he understands the law to teach in order not to be “ridiculous,” but what do standard authorities say it teaches? We hope Bro. Errett does not consider himself set for the defence of the wave-theory. If so, he should confine himself rigidly to “the law and to the testimony” in science, as he so ably does in religion.

Having thus proved by scientific authorities that Bro. Errett’s interpretation of this law is wrong and that our own is correct, and consequently that we are not guilty of misrepresenting the wave-theory, we will now show that the editor of *The Standard*, so far from relieving this law of its “ridiculous” character, makes it, by his own interpretation, fully *seventy-five times* more preposterous than we have represented it! How much, for example, does the sound of a common pitch-pipe diminish in traveling the first foot? Did Bro. Errett ever think of this? He represents a supposed sound as decreasing but the 100th of its intensity in the first foot, or as being reduced from 100 to 99, and in the next foot as being reduced to 96, or a reduction in traveling the second foot just *three times as great as in traveling the first foot!* This is a “square of the distance” with a vengeance, and we venture to say, on a mathematical principle never heard of by Euclid, or any one since his time, till it was published in *The Standard*.

Whereas it is a fact, which he can easily demonstrate, that the sound of a pitch-pipe actually diminishes about 100-fold, or from 100 to 1, in traveling the first foot, while it decreases only about one quarter of one intensity in traveling the second foot! Let him not be surprised at this, nor harbor a doubt till he has tried the experiment by having his assistant blow a pitch-pipe, with his ear one foot from it, thus producing a soft, pleasant sound, and then again with the mouth of the pipe directly in his ear; and he will be satisfied, by its almost deafening peal, that the decrease in traveling the first foot is fully a reduction from 100 to 1, whereas the difference in intensity in traveling the second foot, or from 1 to 2, can scarcely be detected by the most sensitive ear, —possibly a decrease of one-quarter of one intensity. These are simply facts which anyone can determine by a practical test, and without regard to any scientific law. Now as the sound diminishes about 100-fold in traveling the first foot, and, according to Bro. Errett’s patent “square,” *three times* as much in traveling the second foot, it must diminish 300-fold from 1 to 2 feet, making its decrease 75 times more “ridiculous” than our interpretation of the law makes it, which is but four-fold! In other words, calling the original intensity of the sound “100,” as Bro. Errett lays it down in his formula, then if it diminishes in traveling the first foot from 100 to 1, as experiment makes it, and threetimes as much in traveling the second foot, as his interpretation requires, it reduces the sound to 299 times less than nothing, which might be denominated a noisy silence! Bro. Errett really owes an apology to the advocates of the wave-theory for reflecting so “severely on the intelligence of the public,” and making out that scientists believe in a “law” which involves such nonsense as the above.

In all seriousness, if our good-natured critic doubts the facts as we have just given them, as regards the actual decrease of sound-intensity in traveling through the first and second foot, let him drop us a line, and we will at once send him a pitch-pipe by mail, free of charge, by means of which he can convince himself that his improved “square of the distance” is wrong, and that he has got himself into very deep water.

PROF. REPERT JUST AS WE EXPECTED.

In the *Apostolic Times*, of recent date, our “Challenge to Scientists” was published as a special and personal invitation to Prof. Reppert to join us in a practical test of the fundamental law of acoustics, viz., the decrease of

sound-intensity as the square of the distance, the result of which we proposed to him to publish in this paper. After all his boasting that we knew nothing about mathematics in general, and this law in particular, we felt certain that this "Prof. —, A.M.," as he signs himself, would show the white feather whenever it came to a practical test of this law, and frame some excuse to get out of it. And so it turns out. He sends a letter to the *Times* declining to join us in the experiment, and gives "two reasons" (!) for not doing so. And oh, my countrymen, such reasons! One is that he *knows* we are mistaken; and the other is in his own words, "any reader can easily make the experiment for himself, and *readily perceive the fallacy* of Mr. Hall's brazen pretensions,"—and all this, by listening to "a common house-fly!"

What scientific bravery! Does any one believe for a moment that this boastful, self-constituted champion of the wave-theory, who took it upon himself to write two long articles, and send them to the *Times*, against our treatise on Sound, would neglect such a grand opportunity as here offered to meet the author in a practical test of the whole question, if he really thought the said author to be wrong, and that any one could "*easily* make the experiment for himself, and *readily* perceive the fallacy of Mr. Hall's brazen pretensions"? After precipitately rushing into print and meeting an unexpected fate, not supposing that he would be followed by the author's replies, is any one in the State of Kentucky, or elsewhere, so verdant as to suppose that this assailant would not have been only too glad to have a personal collision with the author, and thus expose his ignorance by demonstrating the correctness of this law of acoustics, if he really believed he could do it? If these were the honest "reasons" for his not accepting the invitation for a test-experiment, so much the better would have been his opportunity to get revenge for the unbearable exposure of his musical "nodes" and "cornfield" logic, as copied from the *Times* in another column of this paper. Oh, how this aspirant for scientific fame would have hailed with joy and seized with avidity such a chance to vindicate his almost extinguished reputation for scientific knowledge! How gladly would he have appeared in the columns of *The Microcosm* as having at last demolished the editor by demonstrating that sound really decreases exactly as the wave-theory teaches—400-fold in traveling 19 feet—in opposition to the averment of the said editor who has the "brazen pretension" to say it will not decrease more than about the half of one intensity! But he lets all this golden opportunity pass,—for the "two

reasons" that he knows we are wrong, and that any one can try the experiment with "*a common house-fly*," and prove it! Poor Prof. Reppert!

PROF. W. H. HUMPHREYS.

THIS gentleman, who occupies a chair in the Vanderbilt University, is evidently desirous of achieving scientific fame, though he takes a very questionable and roundabout method of securing it. In April last he attacked our treatise on Sound in the *Central Presbyterian*, of Richmond, Va., in a long and virulent series of criticisms, scarcely reaching the level of respectable quibbles. At the request of Rev. Wm. Dinwiddie, of Alexandria, we replied through the same journal, and so satisfactory to the Professor, that he has not since ventured upon the same ground. But apparently to secure a medium for his attacks in which our replies could not follow and bring him to account, he repeats his assault with renewed bitterness and increased efforts at misrepresentation in the *Southern Presbyterian Review*, of Columbia, S. C., to which our attention was also called by Mr. Dinwiddie, with a request that we reply. We did so, but, as was feared, the management deemed it politic not to allow so respectable a contributor, especially one making such scientific pretensions, to be shown up in his true light, and as totally incompetent to discuss questions involving the relations and operations of the physical laws. Hence, our reply was returned, with the excuse that it was too personally severe, whereas the most personal features of the reply were our quotations of his own coarse and personal epithets, such as "ignorance" often repeated, and showing their undeniable application to himself.

In the next number of *The Microcosm* we will print a good portion of that reply, that our readers may judge of the scientific ability of this representative of Vanderbilt University. Instead of seeking for out-of-the-way journals in which he may strike stealthily and *ex-parte* blows at our book, with a probability that we will not see them, why does he not try to induce some competent and representative professor of physics to accept our invitation to an open and free discussion of the whole question of the theory of sound, in the columns of this paper, on the equitable terms proposed in the August number? Why does he not accept the challenge in the Sept. number of this paper, and try to show the correctness of the fundamental law of the wave-theory—the decrease of sound-intensity as the square of the distance? He would secure ten times more scientific glory and *eclat* by such a trial, if he

having an omnipresence as insubstantial and unreal as the unknowable causation of Herbert Spencer. If gravitation be not a part of God's substantial being,—His invisible fingers, so to speak,—by which he whirls the earth in its orbit and guides *Arcturus* with his sons, then our invisible soul and vital energy, by which we hold this pen and guide it in the construction of these sentences, is not a part of ourselves,—a microcosm,—an epitome of the universe,—and represents God in His mighty works, if we could but discern Him, acting through His invisible forces and visible agencies in Nature, but as really and literally acting, and as truly present wherever these laws and agencies are felt as we are present through our eyes, nerves, muscles, brain, mind, vital force, fingers, and pen, in forming these letters. No other view of God than His personal immanence through and in the substantial laws and forces of Nature, and wherever they act, can give any satisfaction to the mind, or form any rational or scientific basis for the substantial existence of the soul after death.

MAN'S DUALITY.

DR. B. C. OYLER, of Harvard, Nebraska, asks if we regard man as a dual or trine being. We answer yes to both questions. In

one sense man is only dual or double, having a material and an incorporeal entity, the one the exact counterpart of the other, the one the physical, the other the vital, mental, and spiritual organism. In another and scientific sense we may regard man as a trinity, possessing a physical organism, a vital organism, and a mental organism, or that part of his inner and invisible structure that does the thinking, will-ing, loving, hoping, fearing, &c. In a still finer and more analytical sense we can conceive of man as a quadruple entity dividing up his incorporeal being into life, soul, mind, and spirit; but this subdivision would lead to a similar analysis of his physical structure into a muscular system, nervous system, arterial system, venal system, and osseous system or bony framework. Scientifically, and in a general way, we are inclined to a three-fold view of man, making him a physical, vital, and mental being. While *vital* applies to all living things, including vegetable organisms, *mental* applies only to those creatures capable of thought, however circumscribed or limited the range of such mental action, even down to Prof. Haeckel's moneron. But within this grand mental division or entity, no doubt be-long the subdivisions of soul and spirit, the

could succeed in proving us mistaken, and that this ancient law of science is correct, than he can gain by his one-sided attacks in distant journals, in which he no doubt suspects no reply will be admitted. Let him here show true scientific courage and manliness, and help to inaugurate a discussion of the entire question where both sides can have an equal chance, if he is the chivalrous champion of the wave-theory that he purports to be.

WHERE IS GOD?

So asked a teacher of one of his little pupils. Her reply was a clincher,—an interrogation that confounds the ablest scientists and philosophers,—“Where is He NOT?”

Have I and others misread your *Problem of Human Life* on this fundamental verity, that the Universe needs a personal preserver and controller no less than Creator? I conceive the ruling idea of your book to be that *no atom can exist without the presence of God, in some sense, in the law of its being and action*. In other words, that the *Divine Omnipotence* is a reality; and thus *theism* is only veiled Atheism, unless it be a real Pantheism, filling Nature in her totality with God, *without confining him there*, or making tangible substance essential to His Being. The Universe is not God; but take God out of the Universe, and make it a self-regulative, self-evolving, self-preserving system, and it will be a chaos—a nonentity. If God does not preside over and in the law of cohesion that holds my pen together, He is, by strict philosophy and true science, ruled out of the Universe. *Such Pantheism* I conceive to be essential and Christian.

REPLY.

BRO. BALSBAGH has not misunderstood the “Problem.” God’s laws, by which, in a general way, the affairs of the Universe are now conducted, and through which the order and harmony of Nature are preserved, are as much a part of the invisible but substantial God as are our hand and the vital force within it by which these words are written, a part of ourself. We like Bro. B.’s improved *Pantheism*. Take Pope’s idea of

“One stupendous whole,
Whose body Nature is, and God the soul,”

and we see at once a harmonious universe, alike inimical to atheism and that wishy-washy theism which denies personality to the Deity, and makes the Father of our spirits a Being without an entity, a Ruler without a throne,

former applicable in a lower or physiological sense to all animals, while the latter applies exclusively to man, and means about the same as the term *soul* in its higher sense, or as used with reference to man's immortal state of existence. *Spirit*, it is true, is sometimes applied to beasts, but we think improperly, meaning in a general sense their vital and mental organisms. We need a rounder, sharper, and better-defined nomenclature of these various terms; and no doubt in time so important a demand of science will be supplied.

EXPERIMENTS COMMENCED,

WE learn from several colleges that experiments are contemplated with the view of testing the actual decrease of sound-intensity, as suggested in our "Challenge to Scientists," in the September number of this paper. Prof. R. Kelso Carter, C. E., professor of mathematics and physics in the Military Academy at Chester, Pa., has begun a series of experiments by means of new apparatus devised by himself, and will report to *The Microcosm* as soon as his investigations are completed. At the close of his first experiments he writes us a letter, concluding in these words:—

"Of one thing I am as certain as that I breathe, and that is, that a pitch-pipe, blown at 1 yard and 10 yards, does not vary in loudness more than one-third or one-half."

Yet the wave-theory, according to this fundamental law, makes the sound absolutely decrease in traveling from one to ten yards *one hundred fold!* Can such a theory be true?

OUR PRIZE PUZZLE DEPARTMENT,

WE are receiving many answers to the problem of the *spinning top*. These answers will be filed in the order in which they are received; and about the first week in December we will settle down to their examination. Many writers of these solutions request immediate answers. This is impossible, as we are overwhelmed with work, of which this paper is but a small part. Numerous scientific attacks upon our new departures, especially on Sound, in journals in various parts of the country, require answers from our pen, as it seems we are expected and called upon to make these replies, notwithstanding many professors of physics have given in their adherence to the views announced in *The Problem of Human Life*. But the matter being new to them, it requires long mental digesting before the arguments become their own. Hence, our time is wholly occupied for the present; and correspondents will

greatly oblige us if they will pardon a seeming neglect in our not personally answering their letters. If we had the powers of two Napoleons in writing letters we could use them to advantage.

THE DEATH OF DEATH.

THIS is one of the most beautifully written books we have ever read. We have not yet had time to read it through, or more than to skim through its pages; but we never take it up and commence to read, but we are riveted to its sparkling sentences and paragraphs, which overflow constantly with a devout uplifting of the soul to the only real source of consolation and hope—to God, the Father of all. This book is the production of our highly esteemed friend and contributor, Col. J. M. Patten. It contains 250 pages. We hope in some future number of *The Microcosm* to write more fully of its superior excellence, when we shall have had more leisure to examine it.

THE N. Y. CHRISTIAN ADVOCATE.

WE had not intended to allude again to this subject, and would not now do so but for the receipt of numerous letters from Methodist Ministers making inquiry as to what, if anything, Dr. Buckley has done with regard to the unfortunate exposure of his course in the August number of this paper. We answer he has done nothing. To show the impression that this controversy has left upon the minds of many warm friends of *The Advocate*, we give below two letters, as a specimen, from several dozen we have received of similar import. We copy these, not out of any want of friendly feeling toward Dr. Buckley or his paper, but as a caution to rash reviewers that they think well as to what they write in regard to a book before they write it, or at least that they read it before criticising it. No reasonable author or publisher objects to fair criticism, so long as it is candid, even should it be unfavorable.

CLEVELAND, Tenn,

WILFORD HALL.

Dear Sir:—I am the happy possessor of your valuable work—*The Problem of Human Life*,—a work of rare merit. I hope it will find its way into the hands of every man who has read the works of Darwin, Haeckel, Huxley, and Tyndall. It is a regular bombshell thrown into the camp of atheistic scientists. I am astonished and mortified at the course of Dr. Buckley, and regard your severe castigation of him as timely. You certainly placed him in a most unenviable position.

I am a minister in the M. E. Church, and a regular reader of the New York *Christian Advocate*. Your *Literary Microcosm* is a literary gem of rare value. Sincerely yours,

J. B. FORD.

KENT, Ohio, Sept. 3.

MESSRS. HALL & Co.

The specimen *Microcosm* is to hand. Inclosed please find one dollar, for which put my name on your subscription-list, and also the name of C. P. Brusch.

I am a preacher in the M. E. Church, and wish to say for the credit of the ministry, that I was intensely mortified at the character of the criticism of your book which appeared in the New York *Advocate* a few weeks ago. It was unworthy the dignity of our chief paper, and destroyed *in toto* my confidence in the candor and ability of its present management. I trust you may receive such support from the lovers of truth and sound science as both to encourage and strengthen you in your conflict with the powers of darkness. I have your book, and have read and re-read it with a rise in the scale of amazement each successive time. Respectfully,

T. J. KURTZ.

To show the opinion entertained of the book by the clergy of this city, we add the following sentences, from a letter to a friend by the Rev. J. H. Lightbourne, of this city, one of the most eloquent and brilliant ministers of the M. E. Church:

"Such was the charm which this book had over me, and such was my desire that others might share with me in this intellectual feast, that I published 'Condensations' of that part of the review which relates to evolution in one of the public journals of Connecticut. Joseph Cook, the distinguished Boston lecturer, Dr. McCosh, and many others who shape or greatly influence the public religious opinion of the country, had made such concessions to agnostic and atheistic evolution, that Moses seemed to have been supplanted by Darwin, and the Creator unseated and excluded from His own Universe by Huxley and Haeckel. Unexpectedly and unobtrusively, as David rose up in the camp of Israel and slew the blaspheming Goliath, has the unknown Wilford risen up in our Christian camp. Like David, his weapons and his mode are his own.—He is *sui generis*—He is a Daniel come to judgment. God's handwriting in Nature, so bewildering to evolutionists, and so falsely interpreted by them, is as easily read by him as was that handwriting upon the plaster of the wall of the King's palace by the original Daniel.

JAMES H. LIGHTBOURNE,

Pastor of Seventh St. M. E. Church.
22 Seventh St., New York."

[From *The Apostolic Times*.]

WILFORD VERSUS REPPERT.

Editor of the Apostolic Times:

I was surprised to see in your issue of August

17th an attempted reply to my last three letters published in your paper, from the pen of Prof. J. S. Reppert; because I felt sure, in the nature of the case, that no sort of reply from him was possible. In complete verification of this conviction his attempted reply is the sorriest and most suicidal piece of trifling and blundering that has ever fallen under my observation; and I am sure that you, as well as every reader of the *Times*, will agree with me after reading the following analysis and exposure of this scientific abortion.

I will begin by analyzing his attempted reply to my argument against the wave-theory of sound based on the demonstrated slow motion of vibrating strings and tuning-forks, in which I state as a basis that a fork will sound audibly while its prongs are not traveling at the swiftest portion of their swing more than at a rate of *three inches in a second*, being reduced to the one-300th of an inch each swing. To arrive at this conclusion, I was compelled to estimate the proportion of *rest* at the end of each swing to the actual time taken by the swing itself. To accomplish this, I was obliged to employ a very long pendulum, which moves, as Helmholtz declares, on the same principle precisely as a vibrating prong or string, that is, beginning slowly, increasing the motion to the center of the swing, then retarding to the finish, with a momentary rest while turning and starting on the next swing. By means of a very long pendulum, having 100 feet swing, this period of rest was supposed to be about the *one-twentieth* of the time of each swing, and I assumed that the same proportion held good with all swings, even the smallest swings of the prong of a tuning fork. Hence, by deducting *one-twentieth only* from such swings, as the period of rest, giving *nineteen-twentieth's* to the time of actual travel, I demonstrated that their swiftest travel was vastly too slow to condense the air or interfere with its mobility, since Prof. Reppert had distinctly admitted that a movement of the hand, even twenty-five feet in a second, or 100 times the velocity of such prong (as I thus had estimated it) *would not condense the air*. Thus my third reply to his review of my book left the wave-theory utterly stranded, unless this argument could be successfully met, since it proved that sound must be produced in some other way than by condensing the air, and must, therefore, consist of something besides air-waves.

Prof. Reppert, innocent as he is of any true scientific knowledge, saw the force of this argument, and realized fully, unless it was broken, that even an unscientific reader must see that the wave-theory had met its quietus by this single consideration. I can imagine

his troubled dream the night he read that argument; and, severely as he deserved the crushing blow for his boastful attack, my sympathies were called out for him. But in the morning he seems to have decided upon replying; and what think you, reader, is his answer? He claims that though the periods of rest may be *one-twentieth* of the time of travel in the long swings of a pendulum, the proportion of *rest* to the time of oscillation is vastly increased in the short swings, "because the period of rest," he tells us, "is a *fixed quantity*." And then he adds the climax of his philosophical imbecility by announcing a principle of science never heard of before, namely, that "*the time of swing must decrease as the distance is diminished*!" Yes, be it known to the Colleges of Kentucky and elsewhere, that this "Prof. ———, A.M." who volunteers to champion the wave-theory of sound, is not yet aware of the *isochronous* movement of a pendulum—that is, that its *short swings take the same time precisely as its long swings*,—but really thinks that while "the period of rest" at the end of each swing "is a fixed quantity," the swing itself takes less and less time as the space traveled over by the pendulum "is diminished." There is no possible mistake about this being his understanding of pendulous motion, nor about this ridiculously mistaken idea, exhaustively elaborated, constituting his only reply to my argument. In order to make his laughable blunder more startling, and to pillory himself forever as an "egregian," whatever he means by it, he illustrates it by a farmer ploughing his corn and refers to the advantage he evidently gains in having long rows, because it takes just as long to turn at each end in ploughing short rows as long ones (the period of rest being "a fixed quantity"), while the time of ploughing, before he is compelled to stop and turn, gets less and less as the rows become shorter. But I must treat the reader to his exact words, as they are too funny to be lost:

"In all vibrating motion the point of rest or *node* (we choose to use this term) is an important factor in the calculation of distance moved over in a specified time. The farmer, in ploughing his corn, clearly understands the loss of time by frequent turning. The shorter the rows, the greater this loss of time. And it is evident that the rows may become so short that more time is lost by turning than is consumed in ploughing. To illustrate: Suppose a row of 100 yards long, requiring 60 seconds to run the furrow, and two seconds to make the turn. This makes the ratio of time for distance to time for turning, 60:2, or one-thirtieth. Now halve the row, or take 50 yards: *it is evident it requires only 30 seconds to plough the distance, but the time of turning remains the same; hence, we have the ratio 30:2, or one fifteenth.* If we reduce the distance to one yard, this

ratio is increased 100-fold, or becomes 34; and reduce to one inch, and the ratio becomes 120. *Therefore, under this supposition, when the row is reduced to one inch, it requires 120 times longer to turn than to pass over the distance.* Let us now apply these principles to Mr. Hall's illustration. He takes a pendulum vibrating 100 feet, and says, 'The period of rest is one-twentieth of time of swing.' In other words, for every 20 seconds the pendulum is in action, it rests one. This makes a precisely parallel case to the one above. This ratio of one-twentieth he proposes to apply to all vibrations, whether great or small, *failing to perceive that the period of rest is a fixed quantity, and that the time of swing must decrease as the distance is diminished.* For 100 feet, he makes the ratio one-twentieth; for 50 feet, it becomes one-tenth; for 10 feet it becomes one-half; for one foot, 5; for one inch, 60; and for one-three-hundredth of an inch, the ratio becomes 18,000. *Thus, when the vibration of the tuning-fork is one-three-hundredths of an inch, the period of rest becomes 18,000 times greater than the time of swing.* Hence the tuning-fork moves over one inch in one-eighteen-thousandth of a second; in the whole second, giving it a continuously onward movement, it must traverse at the same rate 18,000. Reducing, this becomes 1500 feet, a velocity per second equal to the ordinary rifle-ball.

"This is the legitimate result of Mr. Hall's premises, and a greater velocity than the most extreme advocate of the wave-theory would claim."

Now I really thought that his illiterate use of the term "node," as exposed in my fourth letter (in which he still persists, being evidently ashamed to acknowledge his mistake), capped the climax of scientific stupidity; but it does not begin with this specimen of corn-field science which gravely discusses the movement of a pendulum by ignoring its *isochronous* character, which is its chief peculiarity. Writing in all candor, I do not believe that there is a boy in Houstonville who has ever gone to school one year, who could not have told this astute "Prof. ———, A. M.," that a pendulum makes its long swings of ten or twelve feet in the same time exactly as its short swings of one foot or one inch; and if this unfortunate ignoramus is still in doubt, let him tie a weight to a cord of any length, swing it at full force, and count by his watch the number of swings it makes in a minute; then let him reduce the motion down to his "short rows of corn," so that the weight will not travel more than *one inch* at a swing, and he will find by counting that precisely the same number of oscillations takes place per minute as before! And though the period of rest after the short swings remains the same "fixed quantity" of time as after the long swings, the period of *swing* also remains the same "fixed quantity." Had my critic succeeded in finding somewhere in Kentucky an *isochronous* horse which had the peculiar faculty of decreasing its speed just

in proportion as the rows or corn got shorter, the same as a vibrating prong or pendulum does, there would have been some sense in his illustration, though it would have ruined his argument. It follows, therefore, that Prof. Reppert's final effort and elaborate calculation to show that a vibrating prong may take, by reducing its swings, 18,000 "times longer to turn than to pass over the distance," leaves my argument exactly where he found it, and where it will forever and immovably stand. After contemplating this wretched display of scientific imbecility, how disgusting is the sham advice—"Bro. Hall, we beseech you never, no never, to peril your reputation again in the meshes of mathematics"! Yet this insipidity actually occurs as the introduction to the foregoing mathematical overthrow of the *isochronous* movement of the pendulum! But, laughable as this is, it is a fair sample of the attacks so far made upon my book. The people of Hustonville would add to their credit by taking measures to suppress this so-called professor's pen and set him to ploughing corn, which he evidently understands so much better than he does the principles of physical science. [*Conclusion in next paper.*]

MATERIALISM.

BY REV. B. B. GIBBS.

HISTORY shows that there have always been men who have wished to regard the Creator wholly responsible for the origin and existence of evil. Or they have desired to put Him aside altogether, and have it appear that all that is, came originally from a jingling of atoms. Some have condescended to think that, possibly, the Creator may have superintended such an atomic movement. But evidently the forces were too strong for Him. Hence the evils we suffer. What nonsense! Ancient philosophy asserted, "*Ex nihilo nihil fit.*" This maxim became the source of much trouble to the early Christians. Had heathen philosophers only used it, it would hardly have caused a moment's anxiety to the church. When, however, good men mistakenly adopt an error, and inculcate it with all zeal, thinking they are promoting the cause of truth, they do ten-fold more mischief than an enemy can. Hermogenes was a Christian teacher toward the close of the second century. He no doubt desired to make the Gospel more popular with the heathen. He accepted the sentiment that matter is eternal. Then followed easily the heathen argument in opposition to the Christian view.

"Out of nothing, nothing comes." From these views he came to the honest belief that the existence of the human spirit apart from the body is impossible. He "established matter as his first principle; and, regarding matter as the fountain of all evil, he maintained that the world and everything in it, as also the souls of men and other spirits were formed by the Deity from an uncreated and eternal mass of corrupt matter." He was opposed in all his views by Tertullian and Theophilus,—Christian teachers of that age.

Calling to mind the efforts of distinguished men in these times, we are reminded of what Solomon says: "The thing that hath been, it is that which shall be." The materialism of to-day is the old error. Dress or form may appear new, but the essence is the same.

It is noteworthy. However imperfect men's knowledge of science as to human and Divine relations, the Truth has moved on in the world. Like leaven it quietly exerts its energy. It meets the mind of man as a *revelation* from his Maker. We recognize the instruction as right. Nor is it too much to say that men who concede Revelation feel at once the vastness of the contrast between Materialism and the Gospel.

The Bible does not explain everything in Divine and human relations. Nor could true science. What appears is this: Man lives temporarily in this beautiful house of his earthly body. He is subject to constant evils. But he has Revelation to teach, and the Divine Spirit to call and persuade him. So it comes to be his privilege to seek for himself the highest earthly hope,—to secure for himself the expectation of a most blissful future. And to accomplish all this he has but to act on the motive, and confidence, which impel the former. He wills to have a crop to harvest. He lays the plan, and uses appropriate means. He secures his wish. Hence the apostle says of this salvation that is proffered to men, "It is of faith that it might be by grace." Man is free to seek the good. Not a power in the universe essentially forbids him. Through his *asking* comes the Holy Spirit who works in him the exercise of faith. All his correspondence with Heaven shows this. God, Enoch, Noah, Moses, Joshua, John the Baptist, and Jesus, always appeal to men as free to *hear*, to *choose*, and to *act*. Inspired authority says: "Faith comes by hearing, and hearing by the Word of God."

But Materialism opposes this freedom of the soul. Holding the essential connection of matter and spirit, it binds the mind to the power of earthly surroundings,—excluding hope or the possibility of it. Thus it holds in the foreground the doctrine of *Necessity*. In the last

century Dr. Priestley taught that "all volitions are the *necessary* result of previous circumstances,—the will always being governed by the motives." That the will is thus governed is admissible. But that *previous circumstances lead to all volitions*, I do not see. Certainly not "previous circumstances," but the call of the Lord, on the Damascus road, moved Saul of Tarsus from being a persecutor, to be the most zealous defender of the new faith by Christ Jesus. But to return. The best views we have of human relations teach that man is free. The soul can act separately and apart from the body. But here the materialist makes the most stupid, as it seems to me, and withal, the greatest of blunders.

One instance will illustrate this. I met a friend. He was ten years my senior; he was intelligent and thoughtful; successful in business. He was ready and confident in the expression of his religious views. It was evident he had seceded from early scriptural teachings. He had gone back from the warm and excellent emotions that Truth had once produced in him. Wishing to benefit him, an appeal was made, intended to recall the thought and the feeling of the past. He replied to this effect: "I am weighted and hindered by Nature. I cannot do as I would." He surprised me. Yet if mind in any way comes of gross matter, he was right. But he threw upon his Maker the whole cause of his wrong-doing. I checked him. Paul assures us that he strove to keep his body under. And he teaches all believers thus to do. Then my friend said, "*I can do nothing without my body.*" "What, have you got as far as that?" with much surprise I inquired. "Yes; as far as that." "Listen to me," said I. "Do you not know that a soul can, without moving lip or tongue,—without a change of the countenance, or the use of a single muscle,—without the slightest use of even the least feature of his body,—commit the greatest of sins? Do you not know that he can curse God in his heart? 'The fool hath said in his heart, There is no God.' It is the act, and the crime of the human spirit."

My friend was silent. He could say nothing. His *consciousness* of the correctness of the appeal to his own inner being was the force which compelled silence. These thoughts seem conclusive. They appear to justify the idea, popular with the Christian world, that the spiritual and physical, in man, are separate organisms, though joined in life by a mysterious link. I think our Lord in his conversation with the Samaritan meant to emphasize this very point, in the words: "God is a Spirit, and they who worship Him must worship Him in spirit and in truth."

MICROCOSMIC DEBRIS.

ACCORDING to Dr. Gunther there are 7,000 species of fish now known to men of science.

The Crown diamonds of France are to be sold in order to provide for the better maintenance of the public museums.

A blood beet, a perfect likeness of an elephant, tail, trunk, and all, is a vegetable wonder grown near Lansdale, Pa.

Messages of twenty words, exclusive of address can be sent from any one part of England to another for twenty-five cents.

Erastus Darwin died in London recently, at the age of 77. He was a brother of the illustrious naturalist, Charles Darwin.

A single grapevine at Cajon, Cal., bears five tons of fruit, the weight of which has broken down the sturdy oak tree on which the vine climbs.

On British railroads the guards are sworn in as constables of every county through which the line passes,—an obvious convenience in case of a row.

The project of a second Suez Canal under English auspices is under discussion. The advantages proposed include a quicker transit and a reduced tariff.

Herr Krupp, the great German gunmaker is so much pressed with orders that he has engaged 8,000 more workmen, making the total force of workmen 13,000.

In the mines of Great Britain there are, it is estimated, 378,151 persons employed; and the length of underground tunneling in which they work is 58,744 miles.

A recent writer says that he once abolished bugs in a house where they swarmed by filling the interstices in the woodwork with putty and the cracks in the plaster with plaster of Paris.

Lemon-water and barley-water are now to be seen on the tables of most great houses in England, while at the London clubs lately the run on the iced barley-water has been very great.

During the first six months of this year California produced of gold \$9,418,378, and of silver \$298,264. If this rate be continued for the rest of the year, it would give the largest production since 1874.

There is a weekly sale of toads in Paris, which are brought in casks filled with damp moss. One hundred good toads are worth from \$15 to \$17. They are bought for gardens, to destroy insects.

There are 7,092 public houses and 4,425 beer houses in London. During 1880, 29,868 persons were arrested for drunkenness. Of these, 15,998 were males, and 13,870 were females. The average of arrests for drunkenness is diminishing.

Prof. Pictet, the discoverer of the liquefaction of oxygen, has invented an improved steam vessel with which he expects to attain a speed of thirty-five miles an hour. A model vessel is being built, and will shortly be tried on the Lake of Geneva.

Consul Wilson writes that Palestine is fast asleep. There is only one good wagon-road in all the Holy Land, the one leading from Jerusalem to Jaffa; the newspapers are two, small, feeble Hebrew sheets: and the railroad improvements are yet to be made.

Dr. Barthelmess, of Nuremberg, makes the extraordinary announcement that recent analyses have discovered and scientifically determined the presence of coal formations in meteorolites,—an evidence, therefore, of animal-vegetable life in other celestial bodies than our earth.

The Dreamers are a new Minnesota sect, who believe that dreams are revelations of divinity, and only need correct interpretation to serve as guides to holy living. Their leader professes peculiar expertness in this regard, and his followers report all their dreams to him to be interpreted.

The Old Corea Amphitheater at Rome, the largest amphitheater in the world, was recently opened. It stands on the site of Cæsar Augustus's tomb, and was formerly surrounded by fine gardens. The Corea family, into whose possession it subsequently passed, turned it into a place for public games.

A German statistician estimates that the world contains 1,455,923,000 inhabitants, or 16,778,000 more than it did a quarter of a century ago. He allots 834,707,000 to Asia, 315,929,000 to Europe, 205,679,000 to Africa, 95,405,000 to America, and 4,121,000 to Australia-Polynesia, and 82,000 to the Polar regions.

The marble quarries of Vermont have become enormous excavations, several being 350 feet deep, and the openings are only slightly protected, if at all, while rude stairways down the sides of the shafts afford the only means of descent; yet there is hardly ever an accident, and it is several years since a fatal fall has taken place.

An important and hitherto unknown treatise by Copernicus, on the movements of the celestial bodies, has been discovered in the archives

of the astronomical observatory at Stockholm. This treatise is said to fill a valuable place among the writings of the great astronomer. There is no doubt as to its genuineness, and it is soon to be printed and given to the world.

With an earldom, \$750,000 a year, youth, health, a pleasing wife, a taste for sport, and four of the choicest homes in the world, Lord Roseberry, to whom Mr. Gladstone owes his seat for Midlothian, puts his nose to the grindstone in a subordinate office under that not particularly conciliatory chief, Sir William Harcourt. England may be congratulated on her Roseberries.

In the face of the storm of congratulation with which Dr. Schliemann has recently been welcomed to Berlin, it may be worth mentioning that his "discovery of Troy" has by no means won universal acquiescence from the scientific archaeologists of Germany. Dr. Brentano has just published a pamphlet of considerable size, in which he argues that the site of Homer's city is yet to be found.

A new and extremely powerful soporific has been discovered by an Austrian chemist. A few drops of the mixture sprinkled on the face will stupefy a man in a few minutes. The chemist offered to sell the secret of its preparation to the Austrian government, but the government not only refused to purchase it, but ordered the inventor to discontinue his experiments, and keep the matter secret.

Ninety-eight German Newspapers are older than the present century. Among them the *Frankfurter Journal* is 261 years old, the *Magdeburg Zeitung* 253 years old, the *Leipziger Zeitung* 221 years, the *Jenaische Zeitung* 207 years, the *Augsburger Post-zeitung* 195 years, the *Gothaische Zeitung* 190 years, the *Vossische Zeitung* 159 years, the *Berlin Intelligenzblatt* 128 years, the *Kölnische Zeitung* 84.

In Alaska, northwest of Behring's Strait, alternate layers of ice and soil are found in the cliffs bordering the ocean. In the face of the precipice is, first, a surface of solid ice; upon this foundation is a layer of soil two or three feet thick, and bearing luxuriant vegetation; a little beyond this the bank rises again by a second layer of ice, on which rests soil yielding, like the first, a vegetable growth.

The section of the Brazilian submarine cable from Para to Cayenne is useless, owing to the destruction of its insulation by fish-bites. These bites take place only within a distance of forty miles skirting the coast of an island in the estuary of the Amazon. Examinations show that the cable is attacked by some powerful fish, whose jaws crush the iron sheathing of

the cables and displace the insulating substance.

A work on bibliography, just published in Germany, says that Schiller's "Song of the Bell" has received eighteen French translations, seventeen Latin, fifteen English, four Italian, four Bohemian, four Polish, three Hungarian, two Russian, and one each in Dutch, Norwegian, Danish, Spanish, Hebrew, Lithuanian, Swedish, Slavonic, Flemish, Low German, Wendic, and Roumanian,—in all, 83 translations.

A French chemist has obtained a very valuable oil from the kernels of the grape,—the refuse left after distilling brandy, or making verdigris, being dried and ground in an ordinary mill, and the yield of oil is in direct proportion to the fineness of the grinding. The oil is sweeter than nut-oil, and remains fluid at a low temperature. When burned in lamps it gives a bright, smokeless, odorless, and agreeable flame.

By the statistics of the Brewers' Congress recently held in France, the popular impression of the Teutonic capacity for beer being unrivaled is incorrect. The Briton tops the roll. One-third of all the beer brewed annually in Europe is produced in the British Islands. Counting men, women, and children, every native of Great Britain drinks nearly 143 quarts of beer a year, whereas Germans drink only 94, and Austrians no more than 31.

A St. Louis physician says that the gum exuded from the linden produces a most deadly poison, known as "lindoline." A cat inoculated with a needle dipped in "lindoline" died in eighteen seconds. The doctor thinks that a pin-scratch touched with it would kill a man in less than two minutes. It is an antidote for morphine poisoning, but must be very largely diluted. It is from the linden that most of our wooden toothpicks are made.

At Weissdorf, in Lower Franconia, a highly interesting discovery has just been made. On the slope of the Bugberg, on which probably a castle formerly stood, some children found a gilded iron casket, which had evidently been laid bare by late heavy rains. On being forced open, it was found to contain pearls and stones, a number of rings, and different gold and silver ornaments. There are also a number of gold and silver coins, dated 1517, 1612, and 1624.

Some interesting discoveries have been made in Lower Chaldea by the Vice-Consul of France at Bassorah. He has spent nearly three years making researches among the ancient ruins of that province, and has brought to light a num-

ber of objects, including eight very handsome statues, all of which are covered with inscriptions in the old Babylonian characters, and which are supposed to be 3,300 years old. The French Government proposes to buy the collection for the Louvre.

In the course of a re-arrangement of the Municipal Library at Mayence two printed books from the press of Gutenberg have been discovered, of which the existence in the library had never before been suspected. These are a copy of the "*Tractatus Rationis et Conscientiæ*" (1459), of which another copy exists in Paris, and a print of the Bull of Pius II. addressed to the Chapter of Mayence, and dated 1461. This latter, so far as can be ascertained, is absolutely unique.

Hop-growing is attaining important dimensions on the Pacific coast. California is especially adapted for this species of agricultural enterprise, the dry summers guarding against some of the most serious dangers to which hop-culture is exposed. Oregon and Washington Territory, where there is usually a large rainfall, are producing constantly larger crops. Last year 1,700 pounds per acre was grown in Mendocino County, California. The Golden State raises over half the quantity produced on the Pacific coast.

The Connecticut Bible Society has canvassed 68,859 families, and found 1,493 Protestant families without Bibles, and 11,753 who don't go to church. The Congregational denomination is the most numerous, containing 17,220 families. The Roman Catholic comes next, with 15,315; then the Methodist, with 12,309; the Episcopalian, with 9,907; and the Baptist, with 6,202. There are only 131 Unitarian families in the State; but there are 5,153 that represent themselves as having "no religious preferences."

A fish-propagating company of California is experimenting with a frog farm. New Brunswick furnished the material to start with, 130 frogs being sent from there packed in fresh moss in a box plentifully supplied with perforations for the admission of air. The moss was frequently moistened on the way. On the arrival of the box at its destination only 112 frogs were found, and of these ten were dead. It is supposed that the eighteen that were missing had been eaten during the journey by their companions in confinement.

The Index Society, in England, has completed an index to Mr. Trevelyan's "Life of Macaulay," showing the works which Macaulay wrote, the books which he read, and the friends with whom he corresponded. Novels are the chief publications on which English in-

dexers are engaged. One of them has compiled a catalogue of the characters in the chief novelists, dramatists, and poets of Great Britain. In the first section of this work there are nearly 45,000 characters, and 1,500 of these are found in the works of Dickens.

The Earl of Onslow and the Earl of Carnarvon do not agree with the Archbishop of Canterbury that the chief end of churchmen ought to be to rebut calumnies against the Church. Lord Carnarvon pointed out the apathy of the clergy as an equally vital point; and Lord Onslow called attention to the fact that at fifty-seven churches in the city of London, which have an income of £40,300 a year and space for a congregation of 31,000, there were on a favorable Sunday but 6,732 persons present. Of these 571 were officials and their families, 706 were paid choristers, 227 were paupers for alms, 1,374 were children attached to schools, while of the remaining 3,800 of the general public only 1,200 were adult males.

The lake that has the highest elevation of any in the world is Green Lake in Colorado. Its surface is 10,252 feet above the level of the sea. Pine forests surround it, and eternal snows deck the neighboring mountain-tops. One of these, Gray's Peak, has an altitude of 14,341 feet. The water of Green Lake is as clear as crystal, and large masses of rock and a petrified forest are distinctly visible at the bottom. The branches of the trees are of dazzling whiteness, as though cut in marble. Salmon and trout swim among them. In places the lake is 200 feet deep.

It is interesting to compare the cost of some of the most recent buildings of the present day. The new Grand Opera at Paris cost \$8,000,000; the new Hotel de Ville, \$8,000,000; the new Paris Post Office, \$6,000,000; extension of the Conservatoire of Music, \$1,600,000; the Palais des Beaux Arts at Brussels, \$600,000; the Palais de Justice at Brussels, \$8,000,000. The British Houses of Parliament cost \$17,500,000; the new Foreign Office, Whitehall, \$2,750,000; and the Law Courts are estimated, exclusive of special fittings, at nearly \$4,500,000.

Castelfrentaro, a small town of 6,000 inhabitants, is, it is feared, about to disappear altogether. The town stands on a hill overlooking the Adriatic, and has a deep valley on one side. In 1858 a storm seemed to shake the foundations of the hill, and on the 31st of July last the alarm was given that the town was slipping down. Efforts were made to arrest the process, but in vain; and on the 1st of August the greater part of the town fell in. Of the 6,000 inhabitants, 4,000 found them-

selves thus deprived suddenly of house and home. The remainder anticipate a like fate in a short time.

A lady has discovered a plan to keep water-melons in their natural form and flavor for an indefinite length of time. She has successfully tried it in past seasons, and as a consequence, has been able to treat her family to a water-melon supper at Christmas time. The plan is an inexpensive and simple one, and consists in giving the melon three or four coats of varnish to exclude the air. She says they not only keep from decay, but that the flavor and sweetness are retained; and when eaten at Christmas or New Year's the fruit seems to be wonderfully improved in these particulars.

Major Lauer, of the Austrian engineers, has made some experiments at Krems, on the Danube, on blasting rocks under water, which have attracted considerable attention. Into a cylinder he puts a quantity of dynamite, which is connected with an electrical apparatus. The cylinder is placed on the surface of the rock only, and fixed in that position. No matter how deep the water may be over the rock, it is shattered, when the dynamite explodes, into fragments so small that they are washed away by the stream. This mode of blasting is said to save forty per cent on the cost of removing submerged rocks.

A Leipzig journal devoted to the glass interest, states that the cracking of lamp-chimneys may be prevented by placing them in a pot filled with cold water, adding a little cooking salt, and after the mixture has been allowed to boil well over a fire, to have the articles cool slowly. Treated in this way, glass will be found to resist cracking, even if exposed to very sudden changes of temperature, and the chimneys become very durable by passing through such an operation. The process is, in fact, simply one of annealing; and it results that, the slower the operation is carried on, especially the cooling portion of it, the more effective will it be.

Dr. A. B. Isham, Professor of Materia Medica and Therapeutics in the Cincinnati College of Medicine and Surgery, describes in the *American Journal of the Medical Sciences* a peculiar ante-mortem odor encountered in many cases at a variable period before the fatal result. In one case he noticed it thirty-three hours before death. The smell is analogous to musk, but is rather more pungent and less diffusible. He is inclined to attribute the phenomenon to the liberation of ammonia and of the peculiar volatile oil (fatty acid) which gives the blood its odor, this liberation being caused by the diminishing vitality of the blood.

A German philosopher has been experimenting as to the influence of intellectual labor upon the circulation of the blood. His observations show that the heart-beats are increased two or three pulsations per second. The greater the labor and the closer the attention, the greater the number of pulsations. Thus this philosopher discovered that the study of geometry, to which he had never given much attention, made his heart beat more rapidly than that of philosophy, with which he was already familiar. Concerning the effect of arduous love-making upon the heart-beats, he does not appear to have recorded any observations.

The report of the Government cinchona plantations in Southern India, indicates the astonishing progress made since slips of this valuable tree were first planted in that district, twenty years ago. The number of trees now planted out is more than four and a half millions. At present the greater part of the bark produced appears to be consumed in supplying the medical depots at Calcutta, Bombay, and Madras; but upwards of 3,000 pounds was last year sold to the public, and the annual yield is rapidly increasing with the growth of the trees. The actual profit last year on the capital of the plantation is stated to have been eight per cent.

At Revel, in excavating ground for the new harbor, the hulls of several ships long buried in the earth have been laid bare. Four Russian men-of-war—120 to 180 feet long—have been identified. From the inscription, *Olonets*, 1711, on one of the cannons found, it seems that the ships were wrecked after that date; and the fact is curious, as showing how rapidly the water has receded. In old times the sea evidently came up to the walls of the town, while at present there is half a mile of dry land between the walls and the harbor; and where great ships rode not very long ago the locomotive now runs between rows of wharves and merchants' offices.

Cyprus is afflicted with a plague of goats. The planting the Government proposes to carry out will be useless unless some means can be adopted for preventing damage by the Cyprian goats. The number of goats in the island is estimated at 230,000. They carry no wool, furnish only a bad meat, and hardly give more milk than the sheep,—to which, however, they are preferred on account of their feeding on ligneous vegetation, which the sheep reject. They not only destroy the young freshly grown plants, but browse on the young branches of older trees. St. Helena, like Cyprus, has suffered much from goats. The forests suddenly disappeared between 1710 and 1720, in consequence of the introduction of goats in 1502.

It is estimated that nearly 2,000,000,000 pounds of paper is produced annually,—one half of which is used for printing, a sixth for writing, and the remainder is coarse paper for packing and other purposes. The United States alone produces yearly 200,000 tons of paper, averaging 17 pounds per head for its population. The Englishman comes next, with about 12 pounds per head; the German takes 8 pounds, the Frenchman 7 pounds, while the Italian, Spaniard, and Russian take respectively 3 pounds, 1½ pounds, and 1 pound annually,—the consumption of paper being roughly in proportion to the education and intellectual and political activity of the people.

The new metal of which it is proposed to construct pipes in which to lay telegraph wires under ground is described as very light—only about one-sixth the weight of iron—and, being composed almost entirely of pure carbon, is indestructible, whether in the air or under ground. It does not rust or change by exposure, and is not affected by heat or frost. The most important characteristic claimed for it, however, in connection with underground wires, is its being a perfect insulator. The pipes of the metal need not, it is stated, be buried very deep in the ground, as they may be of a semi-elastic character, adjusting themselves to the slight upheaval and depression of the ground through the action of frost.

Greasy Creek, in Arkansas, is one of the latest natural wonders which this country can boast of. We have already, in response to those lands which raise bread-fruit and manna, produced a spring whose waters are said to taste like turtle soup; but now the Rev. John R. Yeatts, a Baptist divine, is quoted as authority for a spring near Greasy Creek, flowing forty gallons a minute, colored like apple cider, and tasting like applejack. He saw hundreds "lying" around the spring in a state of blissful intoxication, laughing and trying to clap their hands. The name given to these springs is the Millennium Springs; doubtless as signifying that they bring back the golden age. Some persons may refuse to believe in their existence; yet no one can deny that the Rev. John R. Yeatts is a possible and plausible name.

The Chinese and Japanese build most of their vessels of teak. This wood is very durable, and will stand the water better than any other wood that is used for shipbuilding. According to the *Australasian Shipping News*, there lies at the bottom of Dusky Bay a large vessel that can be plainly seen in clear water. She has been there for centuries, and the Maoris have a legend about her. They say that their grand-

fathers told them that in their childhood a large vessel sank in Dusky Bay; that the crew managed to reach one of the small islands, and after living there for years died off one by one. Who they were or where they came from the Maoris could not say. A diver is said to have recently examined this mysterious old hulk. He reported that she is built of teak, and appears to be perfectly sound and firm.

A patent has been recently taken out for a means of steering a ship by electricity. The apparatus is the invention of Mr. W. F. King, an Edinburg electrician, and was recently tried on board a steamer sailing between Glasgow and London. Its object is to dispense with a helmsman, and make the compass itself steer the ship. For this purpose the compass-card is fitted with an index which is set to the true course, and one degree on each side of the true course two metal contact-pins are adjusted. Each pin is connected with a single Daniel cell; and when the ship deviates as much as a degree from her course to one side or the other, the index comes into contact with one or other metal pin. The result is that a positive or negative current flows and actuates a hydraulic apparatus which works the helm.

A new industry or manufacture has been undertaken in England, namely, the production of paint from steel scale, for the protection of iron and steel from corrosion in any position and in any climate. The scale for this purpose is that which falls from the metal as it passes through the rolls; and this is ground by special machinery until it becomes as free from grit as flour, and then it is intermixed with boiling oil and coloring matter. The paint is of two kinds—the anti-corrosive, for use above water to prevent structures from rusting, and the anti-fouling, for use under water, to prevent animal and vegetable life from attaching themselves to ships' bottoms and other iron work. It is claimed that, if painted with two coats of the composition, a vessel may go to India or Australia and return with a clean bottom. The anti-corrosive covering, it is also asserted, is much more effectual for blast furnaces than gas tar.

There is a story that the popular hymn, "The Sweet By and By," was the work of two men while drunk. Joseph P. Webster, who composed the music died several years ago. Dr. S. F. Bennett, author of the verses, lives at Richmond, Ill. He says that the charge of intoxication is untrue, though Webster was a free drinker. The two wrote a hymn-book in 1874, and "The Sweet By and By" was one of the pieces jointly produced for it. The suggestion came from a chance remark by Webster, who

was habitually despondent, that all would be well "by and by." Bennett at once made the rhymes, and Webster brought the music out of a fiddle, which was his customary aid in composition. The hymn-book had its day, and is forgotten; but this one tune is put into every new publication of the kind, and has a sale of about 10,000 copies a year in sheet form. Dr. Bennett says that he and Webster were not orthodox Christians when the hymn was written, and that he is now even less a believer.

Before the year 1729 mustard was little known, according to the *Grocer's Journal*, at English tables. About this time an old woman of the name of Clements, residing in Durham, began to grind the seed in a mill, and to pass the flour through several processes necessary to free it from its husks. She kept her secret to herself for many years, during which she sold large quantities of mustard throughout the country, but especially in London. Here it was introduced to the royal table, where it received the approval of George I. From the circumstances of Mrs. Clements being a resident at Durham, it obtained the name of Durham mustard. The manufacture of mustard consisted in simply grinding the seed into a very fine flour.—a bushel of seed, weighing 60 pounds, yielding 28 pounds to 30 pounds of flour of mustard. A false taste, however, arose for having an improved color, and the flour of mustard was introduced from which the oil had been abstracted. Hence other materials, such as capsicum powder, tumeric, terra alba, wheaten flour, &c., are added to bring up the flavor and to increase the bulk.

THE IMMORTALITY OF THE SOUL.

CAN IT BE PROVED BY SCIENCE?

PAPER II.

IN our first article upon this subject, which appeared in the August number of *The Microcosm*, we endeavored to lay a foundation in reason, science, and philosophy, by which the immortality of the soul could be shown to be clearly probable, independent of Scripture testimony. The first step, and a very important one, in our progress, was there established, namely, that the soul or vital force which animates and voluntarily or involuntarily moves our bodies, must be a *substantial entity*, though immaterial or incorporeal, yet as really and truly *substance* as is the bodily organism which it inhabits, animates, and moves. We need not go over those arguments, but we refer the reader to them as given in our first paper, and

as variously illustrated and elaborated in the discussion with Dr. Hazard on Materialism, in the first, second, and third issues of *The Microcosm*.

We will now look after another important branch of the discussion, namely, the necessarily *organic* and *personal* nature of the soul or vital entity of our being. Without designing to refer to Scripture proof, we may well call attention to the rational and philosophical view taken by the Apostle in speaking of the physical body as the "outer man," and of the soul, or vital being, as the "inner man." The superficial only are capable of denying entitative existence to the soul, on the ground that it is not subject to visible or tangible recognition. Materialistic philosophers who claim, par excellence, to reason logically upon this subject, deny entity to the only part of the man which does the thinking, feeling, loving, hoping, &c., because, forsooth, as they ask, Who ever saw a soul? Who ever handled a spirit? Who ever heard, or smelt, or tasted an intellect? Yet these philosophers gaze upon an inert mass of matter, and see it walk and smile; hear it talk, laugh, and sing; feel it grasp the hand and kiss the lips;—while all these evidences of a substantial but invisible controlling entity within the mass with them go for nothing, because this entity defies the observation of the senses, and does not possess material properties. These are the logicians, who, regarding nothing as substantial save that which is material, are capable of conceiving the idea of a clock running and keeping time without weight, spring, or other substantial motive force. And this is the philosophy that would scout the existence of any such spring or weight, even while seeing the clock run and keep time, if, perchance, such motive force happened to be cunningly concealed in the case beyond the observation of their senses!

We have assumed as an axiomatic principle in science and philosophy, that no inert body can move itself or be moved without the contact of some substantial force, material or immaterial. With this fundamental law as our guide, we cannot conceive of the soul, or "inner man," which moves and manipulates the outward or corporeal body as anything but an entity,—a something as really substantial, though invisible, as is the tangible and external organism it manipulates. If this be true, then it leads us another step, namely, to assume that this vital and mental entity within us is really an "inner man,"—nothing more nor less than an *incorporeal organism*, the exact counterpart of the physical structure, and that the corporeal or "outer man" sees because the "inner man" or the soul looks out through the phy-

sical eyes as we look out through the lenses of a telescope.

Many physiological and psychological reasons swarm before us which go to prove beyond a doubt that the vital and mental part of man is as really an organized entity as is the body itself. No man, for example, has ever given the faintest shadow of an explanation of dreams on the basis of materialism. If the soul, or vital being, consists simply of the physical motion of the molecules of the brain, then how do these vivid visions of real life, and of scenes oftentimes never experienced in waking hours, impress themselves upon the memory, when the will is quiescent and the physical energies are wrapped in slumber, so as to be almost imperishable? What other view of this sleepless soul-activity, and its intelligent operations, than that it is an incorporeal organism, will rationally account for its unmistakable vital and mental impressions? How is it possible for the psychical part of our being, even in our waking moments, to see the most delicate details of intricate machinery far better when the physical eyes are closed than with them open, if the soul has no eyes with which to make these involved and complex examinations? And if the soul has eyes, it has also ears, and brain, and fingers; and hence must be an organism. This is fully discussed in the fourth chapter of *The Problem of Human Life*. But this is only a minor and collateral consideration, going to prove the supposition of the organic nature of the soul. We have reasons for this view too strong to admit of doubt. We will now proceed to name a few of them.

How, for example, are the *bioplasts*—those infinitesimal workers which Dr. Beale sees through his powerful microscope weaving the tissues of the body, nerves, tendons, muscles, arteries, veins, &c.—how are they to work intelligently or systematically if there be no incorporeal structure as a pattern to guide and give directions to their physiological operations? These bioplasts are all alike, or at least are so nearly so that no shade of corporeal difference can be detected under the microscope between those that weave the muscles and those that spin the fibres of the nerves, tendons, veins, and arteries. How can these same little artificers divide themselves off into gangs, and each, like bees in a hive under the general direction of their queen and the special impulse of their individual instincts, go about its own work and pursue it with unflinching precision till the task is done? Philosophers, in their histological researches, have reasoned themselves down to the visible performance of these apparently intelligent workers, as the last tangible link in the physiological chain and the inner-

most key to the problem of life; but here, with one accord, the attempt at solution has been dropped as involved in eternal mystery. But how simple the problem becomes when the vital and mental entity of our being, which alone gives motion to these workers, is looked upon as a veritable organism possessing incorporeal but substantial nerves, tendons, arteries, veins, and muscles, corresponding in all respects, except corporeality, with those of the physical body, or "outer man"! How simple and beautiful are these methodical and semi-intelligent operations of the bioplasts, each plying its shuttle in its own specific way, and thus composing a web of its own peculiar warp and woof as adapted to that particular part of the corporeal structure! How satisfying, also, the explanatory fact that the reason why the workmen set to weaving an artery do not make a mistake and spin a nerve, is because these artisans of Nature are guided in their task by a substantial pattern,—an incorporeal artery of exactly the same form and outline as the one they are weaving, invisible though it be, and unrecognizable by our physical senses! What has there ever been suggested in science or philosophy that throws a ray of light upon this mystery of physiology save the sublime hypothesis here assumed, that we have within the corporeal structure an incorporeal organism which is its exact counterpart, and which answers as the pattern and guide for all the manifold and multiform operations of the physical functions in building and repairing organic tissues?

In *The Problem of Human Life*, while exhaustively discussing this subject, reference is made to the fact that the leg of the salamander, as also of some other animals, if amputated, will be reproduced by growth, even to the minutest details of its veins, joints, nerves, and the color of its cuticle. How do the bioplasts of this little animal proceed in projecting or building out the tissues from the stump of the lost leg, so as to give form and continuity to the new nerves, muscles, tendons, arteries, veins, and bones, each in its proper relation and proportion, if there be no vital leg remaining attached to the stump as the invisible guide for these physiological operations? Why do not the workmen mistake their task, and project another *tail* from this stump instead of a leg, if they have no pattern by which to work?

A certain worm—the *naïs*—can be cut into several sections, each of which, if it contains one of this animal's vital centers, has been shown capable of reproducing the entire worm, by what is vaguely termed re-growth. This can only be explained, however, by supposing

that the *vital entity* of this worm, in its complete though invisible outline, remains in contact with each segment of the animal, as a guide to the deposition of corporeal substance by the working bioplasts. In a case like this we have to assume as the only rational hypothesis, that the incorporeal organism of the *naïs* is of great *vital density*, in order that it may thus be subdivided and still form outline-patterns for so many sections of this animal, each incorporeal form retaining sufficient vital substance to guide the bioplasts in their work.

The same is true, also, in the case of supernumerary fingers on the hands of infants which have been amputated, as recorded in physiological and surgical works. These fingers have been known to reproduce themselves by growth, even to the perfect joints, nails, &c. But what physiologist has ever attempted to give an explanation as to the manner in which re-growth accomplishes such results, that was satisfactory even to himself? Nothing ever written has thrown a ray of light upon this subject, save the fact, as here given, that the child had a *vital hand* within the physical, and as literally and really substantial as is its corporeal counterpart; and hence, when the corporeal finger is severed, the vital but invisible finger still remains attached to the hand to guide the molecules of flesh and bone as they are pushed forward by the little army of bioplasts. Can physiologists form any intelligible guess as to why these tiny workers did not construct a toe on the hand of this child instead of a finger, except by aid of our hypothesis of an invisible, intangible, and incorporeal organism within every living creature?

As corroborative of this view, the soldier feels the fingers of a lost hand for months after amputation. A dog, too, has been known to make attempts to lick a lost foot. No solution of this admitted fact so well accords with these phenomena, or so readily explains them, as the existence of an incorporeal vital organism within the physical, and by means of which growth of parts, healing of wounds, sensation, food-assimilation, and all vital processes, are carried on.

Then a consideration even stronger than these is brought to view, in the problem of inherited characters transmitted from father to son, from grandfather to grandson, and even from remote progenitors down through many generations. It is abundantly established that no inheritance of characters, mental or physical, can take place through the corporeal blood or flesh of a progenitor, since the united testimony of physiologists is that all the matter constituting our bodies changes several times during the period of an ordinary lifetime; and

that not a particle of the substance composing the body of an infant remains with it when grown to maturity.

Many claim that this radical change and displacement of constituent matter occurs once in every seven years, though all agree that it occurs more than once from infancy to old age. How, then, can a remnant of blood or other corporeal substance of the father be transmitted to the son, to say nothing of descending through a line of many generations? Hence, all transmissions of characters, organic as well as mental, must take place through a substantial structure that is not corporeal or subject to this universal law of displacement and substitution. We have not room here to elaborate this conclusive argument, but we regard it as entirely demonstrative that the life-germ transferred to the child by father and mother—that incorporeal entity which constitutes the specific outline, and which guides the deposition of physical particles in order to the maintenance and perpetuity of the specific forms of animals—is that enduring and substantial organism which, though invisible and intangible, descends from father to son, and from generation to generation, and by means of which alone heredity does its work.

This is beautifully illustrated and confirmed in the admitted fact that the ovule from which every living creature develops—about the 125th of an inch in diameter—is exactly alike in all animals, from man down. Darwin declares repeatedly that the “*ovule* of the man, the horse, and the dog, differ in no respect.” Hence, by universal consent something not physical or corporeal within these ovules must represent the actual difference which occurs as the embryos of the different species develop, otherwise there is no reason why a cow should not produce a colt, or a deer give birth to a young tiger, since their ovules “differ in no respect.” Believers in the physical basis of heredity and descent, such as Mr. Darwin, Prof. Huxley, and other materialists, as well as those professed Christian ministers who ignore the incorporeal organism of the soul as here maintained, can give no explanation of the (to them) astounding mystery that diverse species develop from ovules, and even early embryos exactly alike. It is only by postulating, as here done, an incorporeal and specific entity within the physical ovules of all animals by which the future being takes its outline and assumes its mental and vital characteristics as a race, that any solution whatever can be given of the mysteries of inheritance or the observed stability of the species.

If the “inner man” or vital being does not possess organic features, such as mouth, nose,

eyes, cheeks, chin, forehead, &c., then how are the features of a grandfather to be transmitted to the grandson by atavism since every particle of the material constituting those features is lost and replaced by other materials every seven years? Not a single blood-corpuscle of the grandsire ever reaches the grandson. Will materialistic philosophers give some sort of an explanation of this matter by the laws of corporeal descent, or else frankly admit the soul to be an organized entity, and not the mere mode of molecular motion which their moribund theory of human existence teaches? With the view here maintained, all variations of organic beings must first occur in the incorporeal organism, or otherwise they could not produce a variation in the physical structure. These variations take place as a result of the mental and vital perturbations of the mother during gestation, as fully set forth in the *Problem of Human Life*. Mr. Darwin admits that it is impossible to give a satisfactory explanation of these slight modifications, which, as he claims, lead to the transmutation of species. We not only furnish him here with the true cause of organic variations, but with the true reason which confines each species permanently within the limits of its normal structure as a race of beings, with the demonstrable certainty that all those physiological phenomena depend for their occurrence on the fact of the duality of every living creature.

How beautifully then, is this solution in keeping with the well-known fact that the child resembles the father and mother equally, both in its physical shape and its mental qualities! Yet not a thousandth part of its corporeal being at birth has come from the father,—nearly the entire physical entity being the product of the mother, through the transference of her bioplasts and blood-corpuscles to its body. If inheritance were in any degree the result of physical transmission, every child or young animal should resemble the mother a thousand times more than the father. Thus we have proof upon proof that the vital and mental part of every living creature is the essential part, the real part, and constitutes from the start an organism which maintains the form of the specific race to which the being belongs, and that it is this which causes development and forms the pattern, or guide by which the different parts of organic beings can grow or be produced at all. Leave out of view this vital and mental organism, and consider, as does Darwin, Haeckel and Huxley, only the physical or material part of organic beings, thus making the vital and mental part insubstantial, or only the *motion* of the corporeal molecules “placed together in the most varied

manner," as Haeckel expresses it, and no wonder existence as well as inheritance becomes a mystery to which Mr. Darwin begs for any kind of an explanation, however imperfect, agreeing in advance to be satisfied therewith! We have thus given a solution which is not only rational and consistent with various classes of observed phenomena and facts of science, solving at once and completely difficulties which otherwise are hopelessly inexplicable, but a solution of life which is itself infinitely satisfactory, as it gives us not only a firm basis for intellectual improvement here, but a substantial hope of life and immortality hereafter.

It only remains, then, to complete this harmonious explanation, that we give a rational view of the true difference which exists between the human race and the lower order of animals, and a probable reason why the latter will not possess conscious immortality, though possessing here a vital and mental organism. We have treated this branch of the subject at some length in the *Problem of Human Life*, and would, were we to occupy the space, only be able to repeat substantially what was there said. On the supposition that all life and mentality came from God as a substantial part of himself,—an atom, so to speak, from the universal fountain of life and mind,—it would be but a reasonable view to suppose that all these atoms of life and mind, which make up the vital and mental organisms of living creatures, must return again at death to the original fountain, and reconstitute an infinitesimal fraction of the vital and mental being of the Deity, as before. Such would seem to be a rational view, at least with reference to lower animals, whose mental aspirations are incapable of grasping the idea of a conscious state of existence beyond the present. But this supposition is evidently modified in the case of a human being, who, as facts seem to warrant, has had originally implanted by the Creator, and as an ineradicable part of his mental and vital organism, a longing sense of a future life, even down to the lowest and most uncultured tribes of savage men. The evidence from science alone, as here abundantly given, that this "inner man" is not only a substantial *entity* but a real *organism*, is a demonstrative proof that such substantial organism must have been a direct and primordial emanation from a prior fountain of intelligence and vitality, which is, by common consent designated as the God or Creator of the universe. This simple and harmonious fact of an incorporeal vital and mental *organism*, thus proved by science, not only annihilates materialism, but demonstrates the existence of a God, since admittedly no such incorporeal vital and mental entity could have

come into existence from inert matter by any law or principle known to materialistic philosophy. Then if an intelligent God did really create and give to man this vital and mental entity, with the additional endowment, above all other races of organic life, of an aspiration for a future state of existence, it becomes scientific proof as strong as Holy writ that such a state of being is not only possible but an absolute verity, since an intelligent God, capable of thus making us, would not have so endowed us, and so indelibly stamped upon our spiritual organism a longing sense for a future conscious existence, with no possibility in the universe for its realization and enjoyment.

To conclude this argument, we give below a brief communication, which we sent by request of the editor to the *Brethren at Work*, in answer to suggestions of Elder James Evans, which were forwarded to us for our reply:—

[From *The Brethren at Work*.]

LIFE.—MENTALITY.

THE author of *The Problem of Human Life* advocates the theory that life, mentality, &c., are real, substantial entities. This life is not flesh, nor caused by the motions of fleshly atoms, but is real substance, originally proceeding from the Creator, and which returns to Him at death, and is reabsorbed by the original source of life, or else remains a conscious personality. This vital substance called soul is not alone possessed by man, but is shared by all in some degree, even by the little moneron.

It is stated by those divines who affirm that God made all things out of nothing, that beasts have no souls, that the real distinction between man and beast is this: Man has a soul, a beast has not. The Hebrew word for soul is *nefesh*, and is found in Gen. i. 20, 21, 24, 30. To deny a living soul, or a *nefesh hayah*, to all creatures, is to deny like infidels the Mosaic record; for that record plainly teaches that doctrine. So far as a soul is common to all creatures, Mr. Hall is sustained by the inspired record. See marginal references in Gen. i., 20, 30. But if the spirit of the beast is reabsorbed at death into the great reservoir of life, what of the statement of Eccl. iii. 21,—“The spirit of the beast goes downward to the earth”? Mr. Hall might reply that Solomon says no such thing. The German of Eccl. iii. 20, is “*Wer weiss ob der Geist der Menschen aufwärts geht und der Odem [Geist, Heb. Ruach] des Viehes unterwärts unter der Erde fahre?*”—Who knows whether the spirit of man goes upward, or the breath or spirit [same words in Heb.] of the beast is carried underneath?” Martin’s French version renders it “*Qui est ce qui le souffle hommes monte en haut, et que le souffle de la bête descende en*

bas en terre?"—meaning the same as the German. The Vulgate, Septuagint, all render the Hebrew in the form of a question. Who can tell that the one ascends and the other descends? If the soul of a beast is an entity, how can it descend.

DEWITT, MO.

JAS. EVANS.

REPLY.

Elder Evans has a clear, and, I think, quite correct view of the relation existing between the Creator, man, and beast. I have always regarded the language of Solomon as a generalization, and not as specially designed to teach any definite doctrine concerning the distinction existing between man and beast, or as to the difference between them in the future state, simply noting the contrast between the upward, onward, and progressive tendencies of man's thoughts and his mental trend toward high development, and the unprogressive, downward, and earthly tendency of the most intelligent animals, satisfied as their mental longings seem to be with earth and the food and shelter it yields them.

Scientifically considered, I feel satisfied that the view presented in *The Problem of Human Life* as to the true difference between man and beast and the original cause of that difference, is the only correct and reasonable solution of the problem of a future life. If the beast had a mental constitution that gave it the slightest glimpse into a future state of being, or that caused the faintest desire for such a continuance of conscious existence, I should believe with Joseph Cook, John Wesley, and other great and careful thinkers, in the possible—nay, probable—future life of such animal tribes as possessed these aspirations. But as animals below man are not constitutionally capable of such anticipatory thoughts, their lives undoubtedly serve the purpose originally intended by the Creator in placing them on the earth, where they have supplied their wants during the brief period of this temporary existence. How simple and beautiful, then, the thought that the mental and vital substance which animated and inspired these myriads of lower organisms, as fast as they die reabsorbs into the primordial fountain of life and mentality from which they were originally supplied, without an atom of such incorporeal entity being lost or annihilated!

But the same analogical reasoning which would convince us that the beast will not retain an individual and conscious identity after the death of its body, proves also that man will so survive his earthly existence. It is an inbred principle of his constitution and a part of his nature—even in the lowest savage—to long

for and anticipate a life beyond the present; and it is an unanswerable fact that the more uncultured a people are, the more personal, literal, and entitative do these pictures of a future state become, even to the most vivid visions of hunting-scenes which pass before the mind of the unlettered savage, and which no argument of the atheist or materialist can ever eradicate from his belief, or even tend to weaken. If this general idea of a hereafter for man be not an original implantation from the Almighty, then tell me, ye skeptical philosophers, please, why the ideal of the life of the future approaches more nearly to the real life of the present, becoming more and more a palpable fact to the longing heart as the mental and vital stream of humanity is traced back to its primordial source? The solution I was forced to give in *The Problem of Human Life*, and the only one that still affords the slightest satisfaction to my reason, is, that this longing anticipation individualizes the human animal as a race,—not only making it a subject of personal immortality in a future state, but demonstrating the original design of the Creative Will to be that man was destined from the start as a denizen of two worlds; and that the present, in the All-wise councils of the universe, was to be but the temporary school as a preparatory step for a final state of conscious personality. As certain as living creatures are the original products of a personal, supervising intelligence, who knew what He was about in placing man and the countless grades of lower organisms upon this planet, instead of tracing their origin to a senseless and mindless law of Natural Selection, just so certain does this implanted aspiration for immortality in man prove that there is in the realms of this creative intelligence a state or condition somewhere with which to gratify such longing, or else the very implantation would be an exhibition of supreme mockery and infinite trifling.

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RELIGIOUS DENOMINATIONS—NO 4.

THE CHURCH OF GOD.

BY REV. A. SNYDER.

THE Church of God took its rise as a distinct religious community, in the United States, about the year 1829, under the following circumstances: In the year 1820, the Rev. John Winebrenner settled in Harrisburg, Pa., as a minister of the German Reformed Church, and took charge of four congregations,—one in the

city of Harrisburg, and three in the country adjoining. Soon after his settlement in this charge, it pleased God to commence a work of reformation among the people of his charge; which continued to spread until all the surrounding towns and country were affected by it, and hundreds of persons were converted to Christianity. Revivals of religion were new things in those days, in that region, and hence, this work of grace did not fail to excite opposition; and Mr. Winebrenner was greatly persecuted, as well as those who believed and acted with him. This opposition finally resulted in Mr. Winebrenner's separation from the German Reformed Church, and the organization of independent churches, in different places, on what was conceived by them to be the Apostolic plan, as taught in the New Testament Scriptures.

The first church was organized in a dwelling-house, about four miles east of the city of Harrisburg, Pa., in the year 1829,—when, after a sermon by the Rev. Mr. Winebrenner on the *Scriptural Organization and Government of the Church*, a number of persons covenanted together to enter into church relationship with each other, and to take nothing but the Bible as their rule of faith and practice. After this churches were multiplied quite rapidly in the towns and surrounding country; and from among the converts in these newly organized churches God raised up several able men to take upon themselves the solemn and responsible office of the Gospel ministry. These labored and co-operated together for a few years, without any system of co-operation; but finally, in October, 1830, a meeting for the purpose of adopting a regular system of government was held in the city of Harrisburg, Pa.

This measure seemed to give a fresh impulse to the work, and the principles and doctrines of the church spread beyond the limits of the State of Pennsylvania, into a number of the States of the Union, so that they now have fourteen annual Elderships (annual Conferences) in the United States,—three in Pennsylvania, one in Maryland and Virginia, one in Maine, one in Ohio, one in Indiana, two in Illinois, one in Iowa, one in Michigan, one in Kansas and Nebraska, one in Texas and Arkansas, and one in Missouri. These Elderships are constituted of an equal number of clerical and lay representatives, and meet annually for the purpose of co-operation in spreading the doctrines of the church. They have also a General Eldership, or Conference, which meets triennially, and is composed of an equal number of clerical and lay delegates, sent by the several annual Elderships. The design of this General Eldership is to attend to and provide

for the interests of the whole church. The entire number of members in the United States is estimated at between fifty and sixty thousand.

In what are called the “fundamental doctrines and principles of Christianity,” the Church of God agrees with all Evangelical denominations. Their distinctive doctrines and principles may be summed up as follows.—

1. **THEIR NAME.**—“Church of God.” This they believe to be the only God-given and Scriptural name, by which the church ought to be designated; hence they have adopted it, and wish to be recognized and known by it only, and to the exclusion of all others.

2. **THEIR CREED.**—They believe that the Bible is the word of God, and as such, is the only creed, discipline, church standard, or textbook, which God ever intended His church to have: hence they claim to have taken it as their rule of faith and practice, to the exclusion of all men-made creeds, disciplines, &c.

3. **THEIR ORDINANCES.**—They believe that Christ instituted three ordinances or sacraments, in His church, to be observed till the end of time. These are: 1. *Baptism*. In reference to Baptism this church believes that two things are essential to constitute valid or Scriptural Baptism, namely, first, *faith* on the part of the person baptized; and, second, *immersion* in water in the name of the Holy Trinity. 2. *The Lord's Supper*, or Communion. This they believe ought to be administered to Christians only, and should be observed always in the evening. 3. *Washing the Saint's feet* (John xiii., 1-4). They believe that the literal washing of the Saint's feet, according to the words and example of Christ, is obligatory upon all Christians, and ought to be observed by all the churches of God. These are the points in which the Church of God differs from some other so-called Evangelical denominations.

This church has under her control a number of publications. *The Church Advocate* is a weekly paper of considerable circulation, ably conducted by the Rev. C. H. Forney, D. D., in the city of Harrisburg, Pa. *The Sunday-School Gem*, and the *Sunday-School Workman*. These are published monthly, also at Harrisburg, Pa. Besides these the Church also publishes monthly Sunday-School Lesson-Leaves, various books, pamphlets, tracts, &c., by means of which their doctrines and principles are being more generally disseminated.

The Church of God has already considered the subject of education as of vital importance, both in a civil and religious point of view; and from the earliest period of her organization to the present time has given her influence

in favor of education ; and from an early period in the history of her existence has exerted herself to have an institution of learning of her own in which to educate her young men and women. But in all her efforts toward this purpose she has been unsuccessful ; until recently, a plot of ground has been secured in Tiffin, Ohio, and a considerable amount of money has been collected and subscribed for the purpose of erecting buildings, and establishing a college in that place. Thus the long-wished-for project of the friends of this church seems near its accomplishment ; and we trust the time is near when the Church of God will take her stand by the side of other religious denominations in this country in the noble work of educating the young people of our land.

It is but proper to add that the Church of God is popularly known to the world as *Winebrennerians*, out of consideration for the great and good man who acted so prominent a part in its organization and start, though, as before remarked, the church itself repudiates this name as derogatory to the authority of the Holy Scriptures, not out of any want of love for the memory of Mr. Winebrenner.

THE PHILOSOPHY OF PRAYER.

BY REV. C. P. MC CARTHY.

IN the presence of a great national bereavement, it seems to me that the subject of prayer is one about which a few words may be profitably written. There are so many who say their prayers, and comparatively so few who pray, and yet still fewer who understand the true nature of prayer, that even a *little* light on this subject, which appears so abstruse and is yet so simple, may not be unacceptable to the readers of *The Literary Microcosm*. I have, for thirty years of my life, been in the habit of *praying*, and before that time I used to *say* my prayers. I will illustrate what I mean by an anecdote.

On one occasion a number of Episcopal ministers were collected together in an English Parish Rectory. The Rector presided, and the subject under consideration was the nature of prayer. After continued deliberation, and the expression of various opinions, there was one point of agreement in this conference,—they all decided that a liturgical form of prayer possessed greater advantages than any other method. However, an incident during their deliberations caused diversity of opinion, even on this point, which had been unanimously agreed to. An old servant, whose name was Mary, who was cook in the Rectory, entered

to replenish the fire. The Rector knew her to be a devout Christian, and it struck him that he would ask her opinion concerning the matter in hand. He therefore said, "Mary, I want your views about a subject that has been giving us some trouble." The aged cook looked up, and waited. The Rector continued : "We have been considering the difficult subject of prayer ; and though we differ in many points concerning its nature and results, we are in agreement concerning the necessity of possessing a sound form of words. Will you, Mary, be kind enough to say what you think about it?—for you know, as a Christian woman, I value your opinion." Mary, after thanking the Rector for his goodness to her, replied. "You know, sir, you and I don't see alike on that matter ; and if I may make so bold as to speak in the presence of so many of the clergy, I think that you have all made this mistake,—you have been considering the best way to *say your prayers*, but the subject of *praying* has been left out of your deliberations."

The ministers were startled at this condemnation by the cook ; but the Rector gave her a genial smile of encouragement, and asked her for further explanation of her meaning.

"Well," continued Mary, "Paul says 'pray without ceasing' ; and, you know, sir, the dear Lord condemned the heathen for their many prayers. Indeed, sir, I don't think that He told any one even to say prayers until they asked Him ; and His answer then was, 'when ye pray, say Our Father,' &c. I know also, sir, that you teach us that it is our *duty* to pray ; but I never got any good of saying prayers from a sense of duty, because I have got to feel that prayer is a *necessity*, and that I could live no more spiritually without prayer than I could live physically without air."

By this time the look of wonder on the faces of the ministers present changed to that of deep attention, while the Rector, speaking to the cook, said : "Why, Mary, these are some of the difficulties which have been troubling us, and which seem so plain and simple to you ; but how about God not answering our prayers?"

"Ah," replied Mary, "there is where many people are mistaken. God is our Father, and He always answers our prayers, but He does not always give us the answer we desire. He even refused our dear Saviour himself the most earnest prayer of His life ; but he answered it in a fuller and clearer manner. He would not and did not let the cup pass from him. You see, sir, even the dearest and best of the Father's children cannot change the Father's will or purpose, because whatever that is must be best for the child. And then, sir, if you look into the Scripture, you will find that instead of

the dear Lord changing the Father's mind, the act of praying changed the dear Lord's mind; and the second time He went to pray, while the disciples slept, He found His will and the Father's will the same. So, instead of asking for the cup to pass from Him, He said in substance, He was *willing* to drink it according to His Father's will. You see, sir, that the efficacy of prayer does not consist so much in changing God as in changing ourselves. The alteration is less outward, and more inward. There is a mystery here which works like the thunder-storm in clearing the atmosphere, since by the act of prayer calm and peace follow; for we are brought into harmony with the mind and will of God. The work of prayer is really more on us than on God, until our prayers are so completely the utterances of His will that they become—to use a word which you have taught me—a *dynamic force* in the Universe."

After a pause, the Rector said: "Mary, what you say so interests us all, that I would like you to tell us what is your understanding of Paul's statement, 'Pray without ceasing.'"

"Why, sir," replied Mary, "that is very simple; for Paul could not mean that we were always to be saying prayers. Prayer is the spiritual atmosphere in which the Christian lives; but most Christians are suffering from spiritual atmospheric malaria. I have now shown, sir, that man's wish or desire in prayer can not determine or change God's will. Those of us who think this, must have very limited ideas of God's love and wisdom. Sir, such a notion, in my opinion, must even in our own thoughts, degrade God, and corrupt us by feeding our vanity and pride. Christ prayed to escape the cup, and His Father refused to grant this prayer; but He prayed on until His own mind was in accord with God's, and then the answer came. He was not permitted to escape the evil, but His prayer brought Him strength to meet it. The angel that came to comfort Him was the Father's answer to His prayer. Now, to the statement, 'Pray without ceasing,' I can only say that it is an experience. For example, sir, when I get up in the morning, the first thing I have to do is to dress myself; then the thought comes—oh! how grand it is to wear the robe of righteousness this day. Then, sir, I go to wash myself, and my thought is that I may be cleansed by the Blood of the Lamb,—that is, the life, and purity, and goodness of Jesus. My next duty is to light the fire; and so I seem to thirst for the fire of God's love in my heart. When the food for breakfast comes, I am reminded of the heavenly food of truth and righteousness; and so all the day long, everything reminds me

of God's love in Christ Jesus, my Saviour. I think this is 'praying without ceasing.' You know, sir, the highest and best prayer is when you are not asking God for anything, but *waiting* on Him, and in communion with Him. I used to ask God for earthly blessings, but if any thought of this kind comes now, it is in the shape of a desire to know how to do without them. I feel not so much wanting from God, as wanting Himself and His communion. I seem to be in that state of mind intimated by the words of Jesus,—'In that day ye shall ask for nothing.' My thought is that all my wish may merge into God's will."

After this the cook left the room; and when she was gone the ministers, as by one impulse, knelt down, and with burning hearts thanked God for this solution of the mystery of prayer, which His humble servant had made so plain to their minds.

I close this my first contribution to *The Literary Microcosm*, with the touching words of my lamented friend, the late Dr. Croly, of London, on

THE POWER OF PRAYER.

Hast thou climbed ambition's height,
Man of genius, man of might?
Seeing from thy lofty seat,
All life's storms beneath thy feet,
Empire spread before thine eye,
Homage, fear, and flattery?—
Amid the sounds that reach thee there,
Kneel and seek the power of prayer.

Hast thou, in life's loneliest vale,
Seen thy patient labors fail,—
Felt ill-fortune's daily thrill
Waste thine energy of will?
Yet without revenge or hate,
Wouldst thou stand the stroke of fate?
Wouldst thou bear as man should bear?
Kneel, and seek the power of prayer!

Hast thou, man of intellect,
Seen thy soaring spirit checked,
Struggling in the righteous cause,
Champion of God's slighted laws,—
Seen the slave, or the supine,
Win the prize that should be thine?
Wouldst thou scorn, and wouldst thou spare?—
Kneel, and seek the power of prayer.

Hast thou stood beside the bed,
Where the gentle spirit fled?
Sharer of life's hopes and fears,
Youth's first passion, love of years,
Saint on earth, and saint above,
Life of life and love of love;
Wouldst thou shun the last despair?—
Kneel, and seek the power of prayer.

THE ALL IN ALL.

BY DR. C. H. BALSBAUGH.

PATL must have been a pantheist and a mystic. So, also, Paul's Lord. These have

become ugly terms, because ugly people and "science," falsely so called, have belied them. There is a Divine all-presence which all scientists acknowledge, only they concoct for it a name that both reveals and hides their ignorance. All Christians are mystics, and all scientists are no less, but are ashamed to confess it. A man who finds no fitter term for the mystery he meets everywhere in Nature than "the *Unknowable*," is steeped over eyes and ears in mysticism. The great English wave-theory champion, who sees in matter a potency and prophecy tantamount to a personal intelligence superior to all mind and force in the Universe, is a pantheist and mystic, only after the less honorable style. There is something in Nature which scientists cannot ignore: it finds and baffles them at every step in their investigations, and rather than call it God, they name it "Bioplasm," "Unknowable," "Potency," and "Prophecy of Matter." He who was God manifest in the flesh is also manifest in Nature; so that Darwin, Tyndall, Huxley, and other mole-eyed, self-defying speculators, are without excuse (Rom. i., 19, 20). The most unscientific idea ever thought or expressed, is the denial of personal intelligence and will where nothing but these can account for the phenomena considered.

If all things are of God and for God, then all are in God and God in all. God in Nature and nowhere else is the shallowest sophism. No God above Nature and prior to Nature, no Nature. Where personality is disowned, pantheism and atheism are synonymous. The Divine Omnipresence is a reality. So, also, Omniscience. How can these be true without an *immanence*,—a vital, operative *Pan*-theism, to make them true? These are convertible terms. The *Om* and the *Pan* mean Paul's "All in All." God has not wound up Nature like a clock, and then hung up the key, letting the machine run without His supervision. His withdrawal would be the retraction of gravitation and cohesion, so that the machine would not only stand still, but crumble into dust so fine as to baffle Tyndall to find either potency or prophecy. By the Word were all things made, and by the Word of His power *are all things upheld* (John i., 3; Heb. i., 3). He is "the fountain of life," and without Him no lichen can grow, no insect breathe, and no soul think, feel, or act. If an atom can exist without the Divine upholding, then can also a world; and if a world, so can the Universe. Take the Divine superintendence out of the smallest particle of matter, and the principle is admitted which demonstrates His non-existence. Scientists see this very clearly, and it is the corner-stone of their atheistic philos-

ophy. Impersonal law is their God; and besides they assert there is none. And law, they claim, is inherent in matter, self-originating, self-sustaining, and needs no personal author and director. Prayer is the acme of nonsense and silliness, as Nature has no ear to hear, no heart to feel, no hand to help. Rain and fair weather, health and sickness, life and death, and all else, come by law which cares for nobody's cries or tears. These are glorious and solemn half-truths; but without the higher and nobler half, they are lies, the most stupendous, damning lies, which the devil has ever concocted. It is this relegation of the familiar phenomena of Nature to blind, unsouled law, that lies at the root of popular infidelity. Banning God from these, he is neither sought nor found anywhere else. Because God has higher aims and wider reaches than our prayers, and answers in the general better than we petitioned in the particular, it is averred that he answers not at all, because he *is* not.

Where is the proof that law has no father?—or that it is self-executive, and needs neither maker nor controller? Have scientists furnished the faintest shadow of evidence that they have found in Nature a first cause? They are all forced to confess the negative. Just as little are they able to guess what that essential first cause is. Where will they get their data to prove that it is not a personal intelligence as the Bible represents? If not found in Nature, and they have only Nature to deal with, is it not the most egregious audacity and the dullest puerility to deny that it may exist in a sphere which they confess they know nothing about? Must science be turned into inconsistency and cowardice, in order to be credible? Will civil law spring into existence and self-execution without governor or judiciary? Why not, if other laws can and do? The law can as easily hang a man for murder without a personal authority and execution, as a rain drop can fall, or a leaf wave in the breeze, without a personal, invisible presence, in the law which brings these phenomena, to pass. Nothing occurs without law; and nothing without the Law-Maker in the law. No person was ever frightened or encouraged by law as an abstraction. Mother Goose is for babies, and the Arabian Nights for moonshine folks. The criminal is afraid of the personal power expressed in and through law. He knows that the gallows is a harmless pile of timber, unless some person noose him with its fatal hemp. We might snap our fingers at the thunderbolt, laugh at the cyclone, wag our heads at the hailstorm, and ridicule the earthquake, but for the Personal Being, of whose righteousness, and wisdom, and power, these are the expres-

sion. It could no more thunder without a Personal God, than a tin-kettle can drum "Hail Columbia," without some one to beat it. Laws are neither more nor less than personal intelligence directed to specific ends. Gravity is the Divine mind and will, holding the worlds and atoms in their places. The neuralgia twinges and agonies that plow through my body while penning these lines, are as certainly the vindication of Divine righteousness and love, as the lashes that fall on the back of the felon at the whipping-post are the vindication of the justice of the State. The Governor, and Legislature, and Court, are in every stroke, as it comes whizzing down on the quivering flesh. So God is in every toothache, tormenting corn, or gout, and in every ill that afflicts the human body. Sin and pain cannot exist where God is not; for the one is opposition to God, and the other the necessary consequence of infringing His law. *He* makes the sun to rise on the good and the bad, not Nature independent of Him. *He* sends rain on just and unjust, not nonentities which scientists call natural laws, but which the Bible, and faith, and right reason, and true science, denominate God. So says God Incarnate, in whom dwell all the treasures of wisdom and knowledge (Col. ii., 3).

Had the Divine Omnipresence withdrawn from the powder in Guiteau's pistol, it would not have been in the assassin's power to shoot President Garfield. Had God withdrawn His presence from the law of cohesion, that bullet had fallen into impalpable ashes, and never reached its shining mark, no matter how dry and perfect the powder. The law that makes gunpowder explosive is a mystery which scientists can as little solve as the Incarnation. God manifest in the flesh is not harder for faith and reason than God manifest in Nature. There is nothing in the Bible that taxes faith more heavily than a grain of sand, or the germination of a mustard-seed, or the hatching of the most infinitesimal nit, or the function of instinct, or the moral consciousness of man. Before all these facts scientists stand dumb-founded, as destitute of solution for the dust-particle, as for the God-man. Why is a rain-drop round?—and why did Garfield's bullet-wound pain him? Have the Darwins, and Tyndalls, and Huxleys, and Cliffords, and Haeckels found in nature the *ultima thule* of the simplest phenomenon? With all their blatant egotism and swaggering bombast, they are unable to tell why a dog wags his tail when he is pleased. What is the essence of law? What is the sensibility that causes pain? What is the spiritual element that knows there is a right and wrong? Scientists babble about atoms, and molecules, and conservation of

force, and natural laws. What are these laws? How, and when, and where did they start, and whence the infinitely wise precision of their operations? Are they impersonal and unintelligent, and yet wiser than the wisest scientists that ever attempted their explanation? Is there in existence any such thing as intelligence and will? Do not Tyndall and Huxley claim both? What have they ever done to verify their claim that is not outstripped a thousand fold by the phenomena to which they deny these attributes? Did they ever write a book that leaves a millionth part of the evidence in favor of an intelligent cause, as does the volume of Nature from which they gather their data?

Bible and Nature are books of facts and principles. They never contradict each other. They are mutually explanatory. Where Nature says, the Bible says, Yea. Where either says, Nay, the other has an emphatic indorsement. But man's guesses and misjudgments and arrogant assumptions are no interpretation of either. Much that is called science turns out unmitigated nonsense. A more credulous jack-o-lantern man than Huxley is not to be found. It is humiliating and laughable in the extreme to see men like President McCosh, Professor Gray, Rev. Joseph Cook, and a score of others equally eminent in learning and influence, go into hysterics over the misapplied facts and false reasoning of Darwin and his apostles. The Bible is true, and Nature is true, and God is in both; and they dovetail in sublime harmony, putting both pure Darwinism and theistic evolution to shame. In order to be a scientist, or a philosopher, or a divine, it is necessary to get up a quarrel between God in the Bible, and God in the Material Universe. In order to reconcile this suicidal personality, these distinguished theologians crouch so low as to admit that Emmanuel is half God and half monkey! This hybrid philosophy is not half as rational as that of Huxley and Haeckel. If evolution be true, Christ is a monkey in man-stage, and no more. Either spontaneous generation and evolution are the over-topping "damnable heresies" of the ages, the cream of all the sorceries of hell, or the New Testament is the concentrated essence of the father of lies, and Jesus Christ the most audacious, unmitigated imposter, that ever trod the earth. To wed these antagonisms is to make God and devil synonymous. If evolution be the truth respecting the origin of man, the Bible is the most stupendous and outrageous fiction in existence, and the God it claims as its author, the liar of liars. "*I am the way, the Truth, the Life.*" This is the key to Nature, Bible, man, eternity.

There can be no fact without law and philosophy, whether in matter or spirit. Neither may be known, but both are there, in an atom no less than in a world,—in a thought no less than in the whole contents of Divine revelation. To discern them is science. The explorer who recounts the wonders of gravitation, or electricity, or light, and sees only the phenomenal, and denies the personal power whose will the phenomena express, is only half scientific. In the best and highest part of truth he is a blunderhead. To put an uncaused cause in aught but infinite mind is the essence of ignorant twaddle. Such a person is every whit as irrational as if he were to find a fundamental statute in an old law-book, and, while clapping his hands over the discovery, would exhaust his logic in trying to prove that both book and statute made themselves, needing neither legislator nor printer. Such is "science, falsely so called." True science is not simply the knowledge of God's ways, but the acknowledgment of God *in* His ways.

The most rabid, Bible-hating, God-spurning scientists must and do exercise as strong a faith in an uncaused cause, as the most orthodox, illiterate Christian. They cannot proceed a single step without it. And I submit it to the candid reader, which is the most nobly, honestly, and worthily scientific, to place this first cause in dirt as the potency of all that is and has been, and the prophecy of all that will be, or in a Creator of infinite wisdom, power, and goodness?

[From *The Apostolic Times*.]

WILFORD VERSUS REPERT.

[Concluded from last month.]

I NOW turn from the foregoing, which was Prof. Reppert's main answer to my arguments, to minor points in his reply. He repeats his charge that I misrepresent the advocates of the wave-theory by accusing them of teaching that the forward movement of air-waves is the bodily movement of the air, the same as it is carried forward by a wind; and, as if to make the absurd charge stronger, he adds, in his reckless way, that "one hundred passages can be produced from his writings to show that he believes" this to be what scientists teach. I have only to denounce this statement as without the least foundation in truth. Surely, if there are "one hundred" such passages, he ought to be able to produce just one. Now, I make him a proposition. If he will quote one such passage from my writings, or anything bearing that construction, I will make him a present of a book he stands so wretchedly in

need of, namely, a Webster's Unabridged Dictionary! After convicting him, at the close of my fifth reply, of deliberate misrepresentation in substituting "hours" for a "full minute," I took occasion to warn the public against believing anything this critic might charge as to the words of an author, unless verified by actual quotations. I now repeat the caution with emphasis.

Here is another statement to show the extent of his scientific knowledge. He says if a jar of musk should be emptied on the floor, its smell would not be perceived anywhere in the same room if the air was quiescent. This reckless assertion, like his law of acoustics that "sound will not pass from one medium to another," exposed in my fourth letter, and which he now says was "inadvertant," needs the same qualification. By the way, why did he not also qualify his peculiar "nodes" of musical chords as "inadvertent" after his mistake was pointed out to him, instead of still clinging to an error of which a very small schoolboy would be ashamed?

Take another specimen of his crude manner of representing scientific facts by *illustrations* having no application to the case. In my fourth reply I showed that water-waves would not turn one right angle and retain their form and outline as waves, though Helmholtz says they travel "precisely in the same manner" as sound-waves. To refute this self-evident fact, Prof. Reppert resorts to an *illustration*, and with his usual ill-fortune. He refers to the fact that a *tidal wave* will turn round a cape and gradually raise the water on the opposite side of an island! What this has to do in illustrating the action of a system of a dozen or more waves, made by dropping a pebble into a still pond, can no doubt be explained by the man who thinks that the *isochronous* motion of a pendulum "makes a precisely parallel case" to a horse ploughing out corn in a field having long and short rows.

I now come to his last attempt at reply to my argument, based upon the *stridulation* of the locust. That "bug," as he calls the locust (showing the range of his entomological knowledge), is giving physicists a deal of trouble just now, in several of our colleges and universities. If it can be shown logically and fairly that the wave-theory of sound necessarily attributes to this insect the capability of exerting a mechanical energy sufficient to set into rapid vibration millions of tons of solid matter, then evidently the theory, as candid scientists admit, must break down and disappear from physics as a prodigious fallacy of science. Physicists are aware of this, and those of them who feel called upon to attack my book

are cudgeling their brains to invent some way of weakening the force of that argument by showing how the sound of an insect can permeate four cubic miles of air as can the sound of this locust,—whose stridulation must necessarily travel in “condensations and rarefactions of the air,” generating heat sufficient to add *one-sixth* to their velocity or 174 feet a second, by squeezing the air-particles together, and which can be heard only by bending the tympanic membrane in and out 440 times a second,—without involving what my argument claims, namely, that a mere insect must exert millions of tons of mechanical force in producing these results, if the current theory of acoustics be correct. Prof. Reppert writhes under the crushing weight of these millions of tons, and no wonder he wishes to throw off such a load. But, unfortunately for him, he tries to extricate himself by another *illustration* to show how the locust can start the first sound-wave right at its little legs, and that all the rest of the effects of the condensations and rarefactions, heating and cooling the air, &c., have nothing to do with the physical strength of the locust, but depend entirely upon the effects of “action and reaction,” whatever that may mean! Here is his illustration in his own words:—

“Let Mr. Hall place himself in the center of an unruffled lake two miles in diameter, and cast a pebble into it. Observe the action. *This pebble affects only the particles immediately in contact.* These act on the next adjoining; and thus by a process of *action and reaction* the whole surface of the lake is disturbed”! This is a favorite illustration with professors of physics in their anxious endeavors to break the force of my argument; but it results entirely from their misapprehension of the physical laws, and hence is of no avail, as I will now show so clearly that even Prof. Reppert will be left without excuse. He admits a very important truth, however, which underlies the whole problem, and involves more by far than he dreams of. He says that “*this pebble affects only the particles immediately in contact*”! If this be true, how are the waves produced by “a process of *action and reaction.*” Action of what? Not of the pebble, of course, since its action ceases with the water “immediately in contact.” I will venture the assertion that this pretended expounder of the physical laws could not tell, if his life were the stake, how the waves from the pebble travel to the shore a mile away, or what causes them to move, seeing the pebble does not “affect” them. His “action and reaction” are words without meaning, himself being judge. Look at his bungling misconception of the entire process,

after stating this illustration: “Let him proceed to calculate the millions of cubic feet of water this *insignificant pebble puts into motion, and the square miles of tympanic membranes it might disturb*”! Yet he contradicts himself by admitting that the pebble does not put the water in motion, and disturbs nothing except the “particles immediately in contact”! The truth is, he really knows nothing about the illustration he has so formally presented.

Let me now enlighten him, for he needs it. The water is a ponderable body with a smooth surface when at rest, and any projection of its surface above the level, by any cause, will be pulled down by the mechanical force of gravity, and by that alone. The pebble on entering the water raises around it a little ring of wave the exact equivalent of the size and force of the pebble in falling. This, as Prof. Reppert admits, ends the effects of the pebble,—it is all it has to do. But gravitation then steps in; and this mighty mechanical agent pulls down the ring of water raised by the falling pebble, and in pulling it down, presses up another just outside of it but not quite so large; then pulls this one down, raising another, and so on clear to the shore. “Action and reaction” of the pebble, as my critic would imply (though he contradicts himself in doing it), has nothing whatever to do in disturbing the millions of tons representing the entire surface of the lake. It is all done by the mechanical force of gravitation, except the raising of the first ring of water; and even that gravity has a hand in by causing the stone to fall. Thus we explain clearly and intelligibly the cause of waves traveling on the surface of water, whether started by wind or by anything else.

But the case is entirely different in the propagation of sound-waves in air, as taught by the advocates of the wave-theory; and water-waves will not help them in the least. There is no similarity or even remote analogy existing between the two classes of phenomena. The wave-theory represents the air-particles as an infinite succession of elastic springs, which are condensed or squeezed together by the advance of the prong or string: these particles squeeze the next and condense them, these the next, and so on as far as the sound is heard,—the whole process being one of successive condensations of elastic springs having their bearings successively against each other. Of course, gravitation has nothing whatever to do in the case. Let me prove it by an unanswerable illustration. If I push a spiral spring longitudinally and thus compress it, and if that spring bears against and by reaction pushes and compresses another, that another, and so

on through a row of a thousand springs, and if the last spring pushes against a membrane and bends it in, it is perfectly manifest that the force of my hand exerted in pushing the first spring is also the energy which pushes the second and the third, and so on, pushing each and every one of the thousand springs, and finally bending in the membrane against which the last spring in the row has its bearing. What nonsense to talk about a "reaction" that is not originally and mechanically included in the force of the "action" which causes it! This, then, is exactly what the wave-theory tells us that the locust does by rasping its legs across the nervures of its wings. It condenses the air in front of them, which condensation acts as a spring and bears against and condenses the next contiguous air; that acts as a spring on the next adjoining air, and so on throughout the four cubic miles set in motion by this insect's stridulation,—each and every particle in the mass owing its condensation to the mechanical force exerted by the legs of the insect in shoving the first spring, as certain as the thousand springs just referred to owed their individual and joint condensations to the strength of my hand in giving the first spring a shove. The force of gravity, which moves water-waves, of course cannot come into play in this case; and the man who cannot see it is scientifically blind, and not fit to be reasoned with.

Finally, after the countless millions of air-particles have thus been pressed together as so many elastic springs, by the mechanical strength of this insect's legs, at the outer limit of the four cubic miles there is supposed to be an ear stationed which hears the stridulation; and as this ear can only hear the sound by its tympanic membrane bending "once in and once out as each condensation strikes it," as distinctly stated by Prof. Tyndall, it follows that the mechanical strength of this insect, producing "action and reaction," also bends that membrane. To estimate, therefore, the full mechanical energy of this insect in its action upon the mass of air, we have only to make the calculation and find out how many such membranes have room to vibrate in the area of air permeated by this stridulation, and then calculate their weight, and we will have the physical strength of this insect mathematically settled. Shall I give the result again, as I have done in several different ways in *The Problem of Human Life*? Any beginner in figures can make this calculation. By counting the shaking of each membrane as the equivalent of displacing *half a grain*, and allowing a cubic quarter inch of air as sufficient room for its vibration, which block of air is shaken by

the legs of this insect with a force sufficient to shake such membrane if present, it gives, as an indisputable result, the rapid shaking of 2,000,000,000 tons of solid matter as the mechanical force exerted by this insect's legs, if there be any truth in the wave-theory. This is the kind of "science" that is now being taught in our schools and colleges; and it is the work of counteracting this kind of teaching that has called down upon *The Problem of Human Life* the illiterate criticisms of such professors of physical science as the one I have here reviewed.

A. WILFORD HALL.

MAGAZINE EXPLOSIONS.

OUR article upon this subject in the preceding number of *The Microcosm* has excited quite an interest, and has led several professors of physics to inquire into the matter more fully. There is talk in three different colleges that we have heard from, of instituting tests for determining the correctness of our prediction that the air-wave and the sound-pulse sent off simultaneously from an exploding magazine will travel at two separate rates of velocity, and will therefore reach distant stations at different intervals of time. If this should prove to be correct, and that the sound *per se* produces no concussive shock whatever, it destroys the foundation of the wave-theory that sound consists alone in air-waves, and consequently proves that the air-wave sent off from a magazine explosion is not identical with the sound.

Prof. Cheeks, of Washington, D. C., is moving in the matter, and has written to Gen. Sherman, asking that experiments be inaugurated, with the view of testing the correctness of our positions against the wave-theory. The following is his letter to the General of the Army:—

WASHINGTON, D. C.

Gen. W. T. SHERMAN.

Dear Sir: In the interest of Science, I would like to have you, or any officer of the Ordnance Corps you may be pleased to designate, try the experiment of burning a couple of barrels of gunpowder, and observe the effect at two separate stations,—distant, say, one and two miles—with suitable instruments for recording the two arrivals of both the condensed air-wave and the sound-report.

It is desired to determine whether the result will be, that, if near to the explosion the concussive shock will outstrip the sound, and whether if at a sufficient distance from it the sound will arrive some seconds in advance of the concussion. Investigators of sound-phenomena have for centuries past represented the "girdle of intensely compressed air" which

is driven off by a magazine-explosion, and which crushes in windows and even buildings as identical with the "sound-pulse" generated by such explosion and radiated at the same time. This is conceived to be a grave error; and if the result of the experiment should prove the author of *The Problem of Human Life*—wherein he takes Prof. Tyndall to task for his fallacies on the "wave-theory of sound"—to be correct in his hypothesis, then the wave-theory of sound, as well as the undulatory theory of light and heat, will have to be relegated to the sphere of exploded and ridiculous errors.

In this book (*P. of H. L.*) the theories of Professors Tyndall, Helmholtz, and Mayer, have received a great many hard raps. If this experiment is made, and the result should be as I believe it will be, then the whole "wave-theory of sound" breaks down, and the books on physical science must be re-written. I am, respectfully,

P. C. CHEEKS.

In reply to this communication, Prof. Cheeks received two documents, which he has sent to us, containing the reports of the explosion at Hell Gate (Hallett's Point) in 1876, under the supervision of Generals Newton and Abbott. But as the experiments there and the instituted related wholly to the velocity and extent of ground-tremor, the question propounded by Prof. Cheeks is not touched. We hope soon to be able to report definite action upon this matter from more than one quarter, if parties interested do not find the expense of powder too irksome.

EXPERIMENTS COMMENCED.

IN pursuance of our invitation in the September number of *The Microcosm*, for professors of physical science to test the fundamental law of the wave-theory, namely, that *sound decreases as the square of the distance from the center*, several professors have intimated their readiness to enter into careful experiments to test the correctness of this law. Some have already made their experiments; and have thereby completely overthrown the law, and with it the wave-theory of sound. We have only room for a single report in this number, the conclusiveness of which the reader will at once acknowledge. It is as follows:—

PENNSYLVANIA MILITARY ACADEMY, }
CHESTER, October 3, 1881. }

On Saturday, Oct. 1, 1881, the following experiment was performed upon the grounds of the Pennsylvania Military Academy, by the Professor of Higher Mathematics, Capt. R. K. Carter, assisted by Capt. B. F. Morley of the department of Natural Science, and others.

The experiment had for its object the testing of the law lying at the foundation of the *wave-theory of sound*: "*The intensity of sound varies inversely as the square of the distance.*"

THE EXPERIMENT.

Two gasometers were procured, of about one foot diameter, one having a single outlet, and the other two. Each of these outlets communicated separately and directly with the air-chamber. A short piece of rubber tubing was attached to each outlet, and in each of these was inserted a common A pitch-pipe, such as are used by tuners for pianos or violins. These pitch-pipes were selected with great care from a dozen, until three were found that gave precisely the same volume of sound under the pressure employed. This being secured, it is manifest that one gasometer with its two pipes would give a sound just double in volume that produced by the gasometer with one pipe. The instruments were then carried out upon the spacious parade-ground, in order to avoid reflections, and placed upon chairs just one hundred feet apart. Assistants allowed them to blow alternately, and several parties located the point between the two where the sounds from each were of equal intensities. All agreed as to this point: and then the positions of the gasometers were reversed, in order to test any possible influence from relative situations. In the reversed positions the sounds were observed as before, and the neutral point was found to be relatively the same.

RESULT.

The result in every case was, that at a distance of ten feet from the single pipe and therefore of ninety feet from the double pipe, the volume or intensity of sound was precisely equal. Being tested again at a distance of fifty feet between stations, the neutral point was found about five feet from the single pipe, and forty-five feet from the double pipe.

(Signed)

R. KELSO CARTER, Prof. Math. P. M. A.
B. F. MORLEY, Prof. of Physics, P. M. A.
W. M. MORRIS, } Graduates P. M. A.
E. J. MORRIS, }

We will only add that according to the law in question, as laid down and illustrated in the text-books, four pipes at 20 feet from the hearer should have only the same intensity as one pipe at 10 feet. Whereas it is here demonstrated that two pipes at 90 feet have the same intensity as one pipe at 10 feet! Had there been four pipes employed in the foregoing experiment in the one instrument against one pipe in the other, the erroneous character of this law and of the theory based upon it would

have been more startlingly manifest. We hope professors of other colleges will carefully review this experiment of the Pennsylvania Military Academy and report to us the result for publication in *The Microcosm*.

"KIND WORDS NEVER DIE."

REV. DR. A. O. BRICKMAN, Baltimore, Md., writes us :—

"I have been active for *The Problem of Human Life*, and you have sold many a copy through my influence, and you *shall sell many more*. This book is the best missionary that is now traveling through the country, and is destined to prepare the richest harvest for the church of the future,—shaping thousands of minds for the final reception of heaven's message of truth. I have read and reread every word of it, and felt sorry when page 524 came to view. No opera or other feast of the soul and intellect ever afforded me such delight. It was the richest treat of my life."

GLENWOOD, Mo.

Editor of *The Microcosm*.

Your stalwart blows at commonly received scientific opinions at first stagger thoughtful men, and arouse the thinking powers into activity. After a little time taken to recover from the shock, and to rub the mists away, new and most beautiful fields spread out before the mind with a more lovely sunshine and a brighter future, while the glories of the Lord as revealed in the Bible appear to scientific vision. The soul's immortality is at once seen to be a scientific truth, and death a promotion of a "substantial" being to a higher existence.

N. M. ENYEART.

Pastor of the M. E. Church.

P. S.—The Lord keep you humble : give you long life, and health and wisdom to continue and improve, if possible, *The Literary Microcosm*.

N. M. E.

Elder Thomas Munnell, of Mt. Sterling, Ky., writes :—

"I inclose \$4 for two copies of *The Problem of Human Life*. I expect to find the third number of *The Microcosm* awaiting me when I get home next week. Your views are spreading over this State very rapidly, especially among young ministers."

Rev. Charles B. Mitchell, Marion Center, Kan., writes :—

"Please find inclosed \$1 for two copies of *The Literary Microcosm*. I have carefully read your *Problem of Human Life*, and regard it as the best book printed in the past 25 years. I never look at it as it rests in a prominent place in my library without a feeling of thank-

fulness to God. I believe I can take that book and thrash the most blatant skeptic I ever met.

Thankfully yours,

CHAS. B. MITCHELL.

Pastor of the M. E. Church.

[The above are but a specimen. A hundred like them could be copied. H. & Co.]

OUR CONTRIBUTORS.

WE wish, if we have not already said so, to state that we cannot be expected to indorse everything expressed by our contributors. Generally, so far, we have had very little from which we would dissent, and we aim to publish nothing that will not in a large degree prove profitable to the reader. If not in all respects correct, we want it to be that which will excite new trains of thought and inquiry, and ultimately lead to truth by instigating investigation. Be lenient, therefore, ye critics ; and if you do not fully approve everything contained in *The Microcosm*, try to send us something better, and we will publish it.

TWO THUNDER-PUZZLES.

1. WHY does the pitch of thunder sound lower and lower as the distance from the electric discharge becomes greater? Every one has observed that distant thunder is of a deep base tone, resembling the lowest notes of the church-organ, while a discharge close by makes a sharp report. Will some one explain this on the principle of the wave-theory or otherwise?

2. What is the true cause of the long-continued rolling sound of thunder, sometimes lasting for half a minute, since the flash of lightning is almost instantaneous? *Echo* answers "What?" But "echo" is not the answer. Who will tell? No cash prize offered with these puzzles.

MODERN SCIENCE.

It is the boast of science that it deals with actual knowledge—with what we know and can understand, claiming that "where faith begins science ends." It is free, of course, from the verbiage of metaphysics and theology. But take the following definitions by its great modern light, Herbert Spencer:

"Life is the definite combination of definite heterogeneous changes, both simultaneous and successive, in correspondence with external co-existences and sequences."

"Evolution is a change from an indefinite incoherent homogeneity to a definite coherent heterogeneity, through continuous differentiations and integrations."

Is it not a miracle that any monkey ever got through all that, and evolved into a man?

THE INDUCTION BALANCE.

It was but a few weeks ago when every paper in the country was teeming with notices of a wonderful instrument with the above title, which the inventor, Prof. Bell, claimed was capable of locating the bullet in President Garfield's body to the fraction of an inch, except as to depth; and this he assured the public would be determined within a margin of two inches, depending upon the circumstance of the bullet's shape and the proportion of its leaden surface which happened to be turned toward the sensitive coils of the instrument. This apparatus was accordingly applied to the President's body after much preparatory heralding, and every detail of the performance of the scientific inventor was given in the city papers with great particularity.

At the time appointed, the *induction balance* was brought to the White House by the Professor and his assistant; and the doctors and Mrs. Garfield and the principal attendants were present to attest the marvelous character of this scientific experiment. As before remarked, the I. B. was applied to the patient's body, and the bullet was scientifically and successfully located at a point in the right inguinal region; and the only thing, as report gave it, that prevented the scientific knife and dexterous fingers of Dr. Agnew from cutting into the President's groin and fishing out the dangerous missile, was the mere circumstance before named—that the bullet might be one inch or three inches deep, according as its flattened surface or edge should chance to be turned toward the surface of the body. That it was located right where the electrical humming of the I. B. indicated there was no doubt. This was at a little blue spot on the cuticle at the end of a long, narrow channel in the President's flesh, supposed to be the track of the bullet, and along which the catheter had been daily forced to cleanse the wound and allow it to "granulate." Of course Dr. Bliss "smiled" as the lap of the coils touched this blue spot and set the telephone to humming because he had definitely pointed out that spot and predicted it to be the precise location of the assassin's bullet. The science of electricity, under the careful application of an inventor, of world-wide fame, had thus confirmed the scientific diagnosis of the surgeon-in-chief, which was enough to make a responsible professional man smile.

To make sure that no collusion could in any way be mixed up in the experiment, Prof. Bell, with the connected telephone to his ear, turned his back to the patient while his assistant gently passed the I. B. over various portions of the President's body, as a test of the

scientific and wonderful accuracy of the instrument; and as sure as the bending of the sensitive witch-hazel in the hands of an experienced water-wizard on passing over the subterranean vein, the lap of the coils had no sooner reached the preconcerted blue spot on the President's body than Prof. Bell cries, "Stop! that's the place." The scientists then change positions, and precisely the same result is announced. The telephone is then handed to Mrs. Garfield, while the coils are passed over the body by the inventor as before, and she, too, hears the electrical hum of the instrument as the lap of the coils touch the blue spot; but of course not a sound was heard from any other portion of the President's body, because nothing but the immediate contiguity of the leaden missile could thus affect the instrument. The matter was thus scientifically settled; and to the entire satisfaction of the eminent surgeons present. The bullet was right there, and no mistake; but so long as it gave the President no trouble, no cutting would be permitted to remove it.

At last the President died; and behold! the bullet is found in another portion of his body, nearly two feet away from the spot so infallibly and for half a dozen different times designated by this marvelous device.

Now, it is no more than fair to the unscientific public that Prof. Bell should rise and explain how it happened that the little coils of his I. B. so managed to set off the telephone, and with such infallible certainty as to cause it to hum whenever the lap touched the blue spot on the President's body, notwithstanding it was two feet away from the bullet, unless there were some sort of scientific slight-of-hand indulged in over the prostrate form of the nation's chief? True science does not require facts to be doctored, nor instruments to be manipulated, save so far as to evolve facts. What has this great scientist to say in explanation?

HEIGHT OF THE ATMOSPHERE.

PROF. J. L. POPE writes us, asking as follows: "If it be true that the upper limit of the air is really but 45 or 50 miles from the earth, as philosophers teach, and if above that there is only empty space, how are we to reconcile such a state of facts with the view, as given in Mr. Barnes's article on 'Matter' in the September number of *The Microcosm* that a millionth of an atmosphere left in an exhausted receiver will absolutely expand and fill the entire vessel?"

This is a fine point, and requires very nice philosophical discrimination. There are two

forces acting upon any mass of air, and in direct opposition to each other, at least so far as this problem is concerned, namely, gravity, and the expansive quality of the air. If the atmosphere had no weight, then it is evident that its expansive property would come into play and cause it to diffuse equally throughout all space, and would so rarify it that animal life could nowhere exist. Its expansive property, however, is counteracted by the force of gravity; and these together determine approximately the height of the atmosphere on any planet. This being true, it seems quite reasonable to conclude that Mr. Barnes may be in error in supposing that the millionth of an atmosphere would necessarily and equally fill all parts of a receiver. On the supposition that there is a limit to the height of air, owing to the force of gravity counteracting its expansive tendency upward, then might not this same condition occur in a receiver when the rarefaction of the air by exhaustion should equal that of the upper surface of our atmosphere? It would seem that the air in a receiver might be so reduced by continued exhaustion that the expansive force of what remained would not be sufficient to lift the air-particles into the upper part of the receiver, just as they are not raised any higher at the top of our atmosphere. In this event the particles of air remaining in the receiver would fall of their own weight to the bottom, and the upper portion of the vessel would therefore be a perfect vacuum. We confess this view seems altogether the more feasible and probable. To what extent the exhaustion would have to be carried before the remaining particles of air in the receiver would settle to the bottom by their own weight—whether to the one millionth or the ten millionth of an atmosphere—we cannot determine without better facilities than are now at our command for experiment and calculation. It is evident, however, that this point could be definitely determined by a correct estimate of the expansive force of air at different degrees of density in relation to its weight. There is no doubt but this question, in time, will be as definitely determined and settled as is any other matter of physical science.

“THE INDEPENDENT.”

THIS paper seems to have the ill luck to make itself generally obnoxious to respectable journalists. Why is this thus with a paper that was once considered high-toned as a religious weekly? It is evidently because the managing editor is wholly destitute of discretion and even justice in his treatment of authors

and other journalists, and thus unnecessarily provokes hostility. For example, he almost raves at the Boston (Baptist) *Watchman* and the New York *Illustrated Christian Weekly*, because those papers gave flattering reviews of *The Problem of Human Life*, which as this Sitting Bull of journalism declares, advocates “the ridiculous notion that the wave-theory of sound is all a blunder.” More than a year ago the same writer noticed that book; and after turning up his editorial nose at the author's attack upon the wave-theory of sound, concludes as follows: “Such a treatise we frankly confess we do not read, because it is certainly wrong, and not worth the time of perusal.” And of course this self-confessed bigot, closing his eyes to the unanswerable evidence in the book itself, calls those editors fools who do read it, and as a consequence speak of it in the highest praise. It is useless to hold a lighted candle before the face of a howling dervish, who has closed his eyes with such force and kept them closed so long that the optic nerve has become aborted. To those who are acquainted with *The Independent* and its obstinate course, its opinions *pro* or *con* upon any book, or in fact upon any other matter, can have very little weight. If that self-benighted ignoramus, who decides that the book is “ridiculously wrong” without reading it, and then refuses obstinately to read it because it is “ridiculously wrong,” and who ridicules other editors because they are not as ridiculously bigoted as himself, will look at the last page of this paper he will see that he has taken a very large contract if he proposes to call every editor a fool who reads and indorses that book, since the commendations on that page are but a fair specimen of more than one thousand editorial notices now in this office, any one of whose writers could teach the *Independent* both good English and good breeding. If it would be any comfort to this blind leader, we can inform him that the professors of physics in more than a score of colleges have already enthusiastically indorsed the “ridiculous notion that the wave-theory of sound is all a blunder,” a specimen of whose experiments to that effect can be found on the third page of this paper.

But we will waste no more of our valuable space in replying to the comments of a journal concerning which its well-posted neighbor—the *Insurance Record*—can write as follows:—

“Skinning skunks is not a very pleasant occupation, but we deem the work necessary in the case of Henry C. Bowen, and we have devoted some time and space of late to that work. What the skunk is to the lower order of animal creation, Mr. Bowen and the *Independent* are to journalism, and anything calculated to warn the public of the presence of the offensive animal we consider of essential value.

of false science, in whatever branch of research or investigation, it becomes a consistent and appropriate medium for the announcement of well-ascertained or even rationally probable scientific discoveries which may be made by investigators. By "probable," we mean hypothetical discoveries, or those not yet fully demonstrated. Any such additional discoveries, for or against received theories, will be gladly announced in this journal. Persons making the announcements will thus have due credit by record, and all the honor to which the discovery shall prove to be entitled in the future.

DISTINGUISHED MEN.

We propose to treat the readers of *The Microscopism* in each number from this on, with a portrait of some distinguished man,—writer, scholar, scientist, or divine,—with a biographical sketch of the same. We will take first the six great scientists, whose portraits form a frontispiece to *The Problem of Human Life*, and commence the list with a sketch of Mr. Darwin.



CHARLES ROBERT DARWIN was born in Shrewsbury, England, in 1809, and is consequently at the present time seventy-two years old. His father was Dr. Robert W. Darwin, and his grandfather Dr. Erasmus Darwin, both celebrated physicians and authors of works relating to their professions. The subject of our sketch received his early education at the Shrewsbury school, and finished it at the University of Edinburgh. Having a strong love for natural history, inherited from his grandfather, it only required cultivation to make him what he is now admitted to be—the foremost philosophical naturalist of the age.

The recent articles showing the true character of the *Independent* and Mr. Bowen have attracted a great deal of attention, not only outside but *inside* the *Independent* office." Moral: If an editor does not wish to be compared to a very mean and offensive animal, he should not practice its ways.

DR. HAZARD ONCE MORE.

We are not surprised at the ill-natured editorial in *The Clinical Record*, expressing dissatisfaction at the publication of our correspondence with the editor on Materialism. The Doctor accuses us of a breach of courtesy. We did not, however, regard the correspondence as at all private, in any reasonable sense of that term. An editor who enters into a written discussion with an author upon the scientific merits of his book, without an intimation during the entire correspondence that his letters are to be regarded as private, makes himself ridiculous by whining in an editorial, after the letters are published, that the correspondence was private. No man was ever known to make such a complaint, under the circumstances stated, unless he felt satisfied that he had the worst of the controversy. Men who rush precipitately into a written argument upon a subject which they do not understand, are only too anxious, as a general rule, to have their views made public, unless they become conscious that such publicity would prove damaging to their reputations. If the Doctor really feels aggrieved, there is one way he can get even with us, and that is to copy the entire correspondence in *The Clinical Record* without asking our permission, and thus take revenge for our "breach of courtesy." The truth is, the Doctor set us the example by first publishing in *The Clinical Record* portions of his letters, almost verbatim, in what he calls a "review" of *The Problem of Human Life*, immediately after the close of our correspondence. As these extracts were garbled and disconnected, we deemed it but fair to his readers that they should have the privilege of seeing the entire correspondence in *The Microscopism*, if they felt so disposed. If the Doctor really has the good of his subscribers at heart, and will evince it by sending us a list of their names and addresses, we will take pleasure in sending them the three numbers of this paper containing that correspondence unabridged, and thus give them, for once, something worth reading.

NEW DISCOVERIES IN SCIENCE.

As the mission of *The Microscopism* is the establishment of true science and the destruction

In 1831, Captain Fitzroy, commander of H. M. S. "Beagle," offered to any naturalist who would accept it, a part of his cabin for a voyage of survey and observation around the world. This offer was gladly accepted by young Darwin; and from this circumstance dates the commencement of that wonderful career which has made its author one of the most noted characters in the history of science. The "Beagle" was four years and ten months in circumnavigating the globe, during which Mr. Darwin made the observations and took the memoranda which have since resulted in that remarkable book, "The origin of Species," which has made his name so famous.

On his return to England, he set himself about preparing the results of his voyage for publication, which appeared in different volumes: one, the "Zoology of the Voyage of the 'Beagle'"; another on "The Structure and Distribution of the Coral Reefs"; another, "Geological Observations on Volcanic Islands"; and the last in 1846, "Geological Observations on South America." To aid him in these works the Government granted the sum of \$5,000 out of the treasury.

Like most men who have become famous for scientific achievements, Mr. Darwin had to struggle with poverty, and from the start fought his way up through many adversities and discouragements, till the value of his scientific works became known, and finally remunerated their persevering author.

In 1859, after twenty years' persistent labor, Mr. Darwin published his "Origin of Species," in which he took the bold stand, no doubt from honest conviction, that every form of animal life, including man, originally sprung from the lowest existing forms of mollusca, through numerous successive modifications, by a law which he calls Natural Selection, or Survival of the Fittest. This book at once made his name famous in every civilized land; and whatever philosophers and the clergy generally may think as to the erroneous character of this theory, one thing is certain—that a vast majority of scientific thinkers throughout the world have accepted his views as based on the immutable laws of Nature.

Since this work was published he has been constantly busy in developing his main hypothesis by the publication of other works on collateral subjects, among which are the "Descent of Man," and the "Variations of Animals and Plants under Domestication," which have been extensively read in both Europe and America. Indeed, no educated man considers his library complete till it contains the works of this author, whatever he may think of their scientific correctness.

FEELING IN AMPUTATED LIMBS.

WE see in our exchanges many notices similar to the following, which we copy. Will the reader compare them with our article on the *Immortality of the Soul*?

[From the Mitchell (Ont.) Recorder.]

A STRANGE CIRCUMSTANCE.—It will be remembered by our readers that some two weeks ago a son of Mr. George Rock, age about twenty years, had a leg amputated above the knee. From the time of the operation up to Saturday last he got on very well, but complained very much of cramping pains in the foot that was gone. Day and night he said that he felt that the foot was still a part of his physical system, and he could distinctly feel cramping pains in it. On Friday last, Mr. Rock was in town and told a friend about the matter. The friend asked him what disposition had been made of the severed limb, as he had read of cases where amputated limbs had been thrown into uncomfortable positions, and that the patients from whom they were severed felt much distress in consequence, and could not be quiet until the lost member had been removed and placed in an easier and more comfortable position. Mr. Rock smiled an incredulous smile at the idea, and said the limb was all right. During that night the young man suffered more than usual, and insisted that his toes were all drawn up and pressed together. Being somewhat impressed by what he had heard, and moved by the piteous moans of his son, Mr. Rock had the leg, that had been placed in a box and buried in the garden, taken up and examined. Curiously enough the box was found to be too small for the limb, and, in order to fit it in, the toes had been doubled and jammed down just as the patient had described. The foot was straightened, the toes properly adjusted and wrapped in cotton batting, and buried again. During the straightening out of the foot and toes, the patient is said to have cried right out that something was tearing his foot to pieces; but no sooner was the leg reburied than the pain ceased, and has not been felt to any extent since. This seemingly strange circumstance is but another evidence of the supposition that a strong sympathy in some mysterious way continues to exist between a severed member and the body, until the former has decayed away; but how to explain it seems to be a difficulty yet with all scientific men.

[From the Nevada Enterprise.]

Mr. J. O. Eldridge, the well-known auctioneer, of the firm of H. M. Newhall & Co., of San Francisco, writes the following note:—

"A gentleman called my attention to an

item in your paper regarding a lad whose arm had been amputated, and what he suffered, and the removing of the same and its results. Fifteen years ago I lost a leg, and it was closely packed in a casket, causing me constant, terrible pain. A good wife, unknown to me, sent a faithful servant to arrange the amputated limb comfortably in a new and larger casket. The moment the leg was handled I knew it, and the comfort began then and has never ceased, and I could tell the position precisely in which the missing member was placed. I am glad to know my experience is verified; but just how to account for this let the wise men tell. This is the first time any allusion was ever made to this matter by myself, and I only allude to it now to add my testimony to that of the little lad, that missing members do in some mysterious way convey to us the sense of feeling. I am well known to many in your community, and the peculiar circumstances attending my loss, if you desire, you can publish."

To this the editor of the *Reporter* appends the following comments:—

"May not this strange but well authenticated class of facts be scientifically explained on the principle developed in *The Problem of Human Life* a work reviewed elsewhere in this paper? The author shows, from many cogent scientific proofs, that there is within the physical limb also a vital, invisible, and incorporeal limb, of the same form, yet as truly substance as is the organic bone or muscle which suffers amputation; and that when the physical limb is removed, its vital and substantial form remains joined to the body, though he also shows (from the segmentation of the polyp, in which each section reproduces by growth the complete animal) that a portion of this vital substance may, and probably does, cling to the lost member for some time after the amputation takes place. If there is such a vital and substantial limb as the counterpart of the physical, which seems to be clearly demonstrated by the writer, will not the visible relationship existing between the complete vital form still connected with the body and the lingering partial form accompanying the buried member, fully and rationally account for this mysterious sympathy, which the testimony of so many living witnesses has proved to exist? It would seem, from such facts as these, that we are but barely upon the threshold of biological and physiological science."

LITERARY AND EDUCATIONAL.

☞ WE propose to add, commencing with the next number, a column of book-notices,

literary and educational items, for the benefit of our readers who may wish to keep posted in those departments of journalism. We had intended to commence this department in the present number; but the space occupied by our lengthy editorials prevented.

☞ Let every subscriber be sure to begin his subscription with the first number of this volume, whatever time he may subscribe. He cannot afford to lose one number of this paper, owing to the continuity of articles from month to month, of vital importance to every one who reads and thinks. *Fifty cents* are only a bagatelle in comparison to the revolutionary discussions contained in any single number of this paper. We can supply all the back numbers.

☞ Subscribers are overwhelming us with postage stamps. We had no idea when we offered to take stamps in pay for subscriptions that so many subscribers would take advantage of it. While we would not wish any subscriber to withhold his subscription because he can send nothing but stamps, please try and get another subscriber to join you and thus send a dollar bill in a registered letter, or get a postal money-order, which is better. There is really no safe way of sending money except in the form of postal-order, bank-draft, or registered letter. Think of this.

☞ In mailing our papers we wrap all going to one office in a single bundle, with the name of each subscriber on the margin of his paper. If any paid-up subscriber does not get his paper it is not because we failed to send it, but because the postmaster has not delivered it. Please ask for it.

☞ If friends at a distance do not hear personally from the editor of this paper, even in answer to letters, they must not attribute it to a want of the kindest feeling on his part. He is overworked by the incessant demands upon his time and pen; and in a field, too, in which it is thought that no one else can take his place, as will be seen by some of the editorials in this paper. The silver cord is liable to be broken, if too much strain be put upon it. Be generous, then, kind reader, and great will be your reward if our scribbling is worth anything.

SOUND—TYNDALL'S TIN TUBE.

IN our last article on the nature and phenomena of Sound, in the October number of *The Microcosm*, we examined at some length the views of scientists concerning the effects of magazine-explosions in breaking windows at a distance, in which we showed that they all with one accord, have mistaken the compressed

air-wave, sent off by a sudden generation of gas, for the "sound-pulse" itself, and that our greatest physicists teach that it is the actual *sound* of the explosion, and nothing but the sound, which, nearer to the magazine, *destroys buildings, kills men and horses, and scatters their fragments over acres of ground!* Surprising as such teaching is, yet no scientist pretends to deny this allegation, which we published more than three years ago, while it is a fact that professors of physical science in our colleges and universities still continue to teach their classes the same thing.

We now consider another and even more surprising phase of this theory, and will examine the experiments made use of by acousticians for its elucidation,—experiments which are repeated by college professors everywhere before their classes with all the nonchalance imaginable, and without apparently suspecting that such illustrations are totally false and misleading, or that the supposed facts upon which they are based are without the least foundation in Nature or true science. This we acknowledge to be a grave accusation, which, if unsupported by proofs, ought to blast the scientific reputation of the man who makes the charge. We are willing to be judged by this test, and let the following considerations justify or condemn.

We could produce many other authorities for the general scientific position we are about to call in question, but we have chosen to cite Prof. Tyndall as ample authority, being the highest known in this country upon the subject of acoustics. The position we now propose to controvert is Prof. Tyndall's well known experiment with a tin tube and lighted candle, as illustrated in his *Lectures on Sound*. The tube is two inches in diameter, and fifteen feet long; and the aim of the lecturer was to drive a "sound-pulse" through this tube by clapping two books together at one end, and thus extinguish a lighted candle placed at the other end, without, as he insists, the passage of any air through the tube. As will be seen by examining the figure in his book, the tube is made with a wide flaring mouth at one end, at which the books are to be clapped, while the other end terminates in a small, conical outlet, for the purpose of concentrating and directing the "pulse," as the lecturer calls it, upon the flame of the candle. It is plain that this view of the action of sound is in perfect keeping with the supposed effect of magazine-explosions just referred to, both teaching the same view of science, namely, that the sound-pulse is nothing more nor less than a compressed *air-wave*, and that this wave, without carrying the air along with it, is capable of shattering

glass, blowing out candles, &c. To give the exact teaching of the theory upon this phase of the subject, we will quote the language of its chief exponent, Prof. Tyndall, as recorded in his *Lectures on Sound*, revised by himself:—

"At the distant end of the tube I place a lighted candle, c. fig. 4. When I clap my hands at this end, the flame instantly *ducks down*. It is not quite extinguished, but it is forcibly depressed. When I clap two books, BB, together, *I blow the candle out*. You may here observe, in a rough way, *the speed with which the sound-wave is propagated*. The instant I clap, the flame is extinguished; there is no sensible interval between the clap and the extinction of the flame. I do not say that the time required by the *sound to travel through the tube* is immeasurably short, but simply that the interval is too short for your senses to appreciate it. To show you that it is a *pulse* and not a *puff* of air, I fill one end of the tube with the *smoke of brown paper*. On clapping the books together, *no trace of the smoke is ejected from the other end*. The *pulse has passed through both smoke and air without carrying either of them along with it*."—*Lectures on Sound*, p. 12.

In the annals of scientific investigations and experiments there is not, perhaps, another instance on record where a noted scientist has exhibited such inexcusable lack of philosophical knowledge, or who has so grossly falsified the simple facts developed in an experiment, as in the case here described. One is puzzled to find words in which properly to characterize this description, without being too severe on its distinguished author. We must, however, be explicit and frank, in order to be just to the young students of our land, and impartial to the cause of scientific truth. That Prof. Tyndall correctly represented the current sound-theory in his explanation of the facts developed in his experiment, there can be no doubt. But did he correctly represent the facts themselves? We answer, No; and we will now prove that the whole statement is scientifically false, from beginning to end.

A tin tube, like the one here described, can be produced for a trifle, as half the length named produces precisely the same result. Hence, any student desirous of ascertaining the truth upon the subject can test the matter for himself in his own private room, with some friend as an assistant. If he will do so honestly (and he surely ought not intentionally to deceive himself), he will find the following facts fully established, and in direct opposition to the statements made by Prof. Tyndall:

1. Let him hold his cheek near to the conical outlet of the tube, while his assistant claps the books together at the large end, and he will feel a *puff of air* shoot out of the tube against his cheek every time the two books come together. This is the same puff of air,

precisely, which blows out a candle when the flame is placed at the small end of the tube. This puff of air will also swell out and fill a delicate *paper bag*, if its mouth is tied firmly over the conical end of the tube. Prof. Tyndall would have to say, as a matter of course, that this bag is distended and *filled with sound*, since "the *pulse* has passed through both *smoke* and *air*, *without carrying either of them along with it*." This would beat Baron Munchausen's frozen horn, which played its music as it was thawing out, since rubber bags filled with sound might become useful commodities of trade, and would do service as pillows, mattresses, &c., for those who wish to enjoy *sound sleep*! But seriously, what is it that fills the paper bag at the small end of the tube as the books are clapped together, if no *air*—nothing but *sound*—passes out of the tube? Echo answers, What? Does Prof. Tyndall answer "ECHO"?

2. Let the student next slip off the last joint of the tube containing the conical outlet, and fill that end "with the smoke of brown paper," and then replace the joint, and observe, while his assistant claps the books together as before, and he will witness a visible *puff of smoke* pass out of the tube at every clap. Of course, if the smoke should be inserted in "*one end of the tube*," and that the large end, as was done by Professor Tyndall, *fifteen feet away from the outlet*, "no trace of the smoke is ejected," when the books are clapped together. Why? Simply because the smoke would have to travel the whole length of the tube before it could make its exit at the small end. This, of course, cannot occur by a single clap of the books. On the contrary, experiment demonstrates that it takes not less than fifteen or twenty powerful claps of the books to drive the smoke fifteen feet in such a tube, after which a visible puff will be ejected every time the books are struck together, till the quantity of smoke is exhausted. Of course, it is apparent that the smoke cannot be thus ejected unless a puff of air accompanies it. Hence, it is the "puff of air" which "blows" the candle out, and not the "*sound-pulse*;" and we are astonished that not one of the hundreds of scientific men who heard these lectures and witnessed these oft-repeated experiments, had the courage, if he had possessed the knowledge, to set the Professor right. But it is even more surprising when we reflect that these *Lectures on Sound* have for ten years been used as a text-book in every college and university in this country and Europe, and yet no teacher of acoustics has exposed or even detected this self-manifest crime against the scientific intelligence of the world.

3. To demonstrate that the *sound* (which occurs by clapping the books) has nothing whatever to do with extinguishing the candle or causing it to "duck," let the student hold a piece of board firmly and strike it with a hammer in front of the open mouth of the tube, but so hold it edgewise that the motion of the board, on receiving the blow, will not drive air into the tube, and though the sound may be a hundred-fold more intense than that of the two books clapped together, *no effect whatever will be produced on the candle*, though a hundred times as much sound goes through the tube! Then let him turn the board with its broad side toward the tube and give it the same blow as before, and it will at once blow the candle out,—not on account of the sound, but because in this position it suddenly forces a body of air into the open mouth of the tube, just as did the two books when clapped together by Prof. Tyndall.

4. Should the student need further proof of the fact that Prof. Tyndall and the wave-theory are all at sea on this subject, let him fill the tube with the fumes of burning sulphur, and then hold his nose at the conical end while his assistant claps the books, and we venture the scientific prediction that he will remove his head suddenly with a well-defined impression that something besides a "*sound-pulse*" is ejected from the tube,—since science, with all its remarkable discoveries, does not yet teach that sound addresses the *nose*.

Several other experimental tests could be named which would equally demonstrate that the sound has nothing whatever to do with causing the candle to "duck," but the tests here named are deemed sufficient not only to convince the reader that Prof. Tyndall was mistaken, but to convict the wave-theory of sound as a baseless fabrication. There is no doubt that the Professor was led into this error partly by his experiments with singing and dancing flames. But it is a fact that no flame will dance or respond in the slightest degree to sound unless the vibrational number of such flame and that of the sound agree, and thus one influences the other on the principle of sympathetic vibration. This, however, does not require a long tin tube, but the result is the best produced in an open room; and hence can form no reasonable excuse for such unpardonable blundering as was exhibited in the experiment just reviewed. We do not by this, however, wish to insinuate aught against the integrity of Prof. Tyndall as a conscientious scientist. But as he is a public lecturer and a sound-expert of high authority in our schools and colleges, he becomes a proper subject for public criticism, and we have a just right to

hold him to account for the lessons he teaches in science, and for the principles of philosophy he puts forth in his text-books. We expect no mercy at the hands of the advocates of the wave-theory, and we confess that we desire none; and hence, we adopt the golden rule in dealing with this theory and its exponents. We have a right, therefore, to ask if it is possible to believe that Tyndall did not know, when he put the smoke of brown paper into the big end of the tube, that it would require more than one single clap of the books to drive it fifteen feet? Can it be possible that such an inquiry as this never suggested itself to his mind? Is it at all probable that he never thought of putting the smoke into the small end of the tube and then clapping the books together to see if a "trace of the smoke" would not be ejected? Is it likely that a man of such versatile talent, profound knowledge of physics, wide experience in scientific investigations, and ample means for making careful experiments, never thought of the idea of filling the whole tube with the smoke of brown paper, a thing so easily done, instead of filling "one end" of it, and the very end which would best serve the interests of the wave-theory by not permitting the smoke to be ejected? Does it seem probable or reasonable that this world-renowned scientist, in preparing himself for these lectures and in supervising numerous translations and republications of his books, containing detailed descriptions of these experiments, never thought of the idea of producing an intense sound at the mouth of this tube in such manner as not to drive air into it, as we have suggested, by striking a board with a hammer, and then noting its effect (or rather want of effect) on the candle? And is it conceivable that the clapping of the two books together in front of the open mouth, and in such manner (as shown by the figure in his book) as most effectually to force the air into the tube, was purely accidental?

Now we put these questions to the scientific student, and to the impartial investigator of physics, not, as before observed, even remotely to insinuate dishonesty on the part of this distinguished physicist, but to point an important moral, namely, that when a false theory once gets full possession of a man and becomes also universally adopted as science, even its most trustworthy and candid advocates, without realizing their own disingenuousness, many times become impelled to falsify the truth, mis-state facts, and misconstrue phenomena, in order to warp their experiments into harmony with said theory.

It occurs to us that Prof. Tyndall himself would be the proper person to explain this

puzzling enigma, and thus tell us how he came so grossly to misrepresent the facts of this experiment. Accordingly, we quote his own solution of the mystery from his *Fragments of Science*, p. 47:—

"The desire to establish or avoid a certain result can so warp the mind as to destroy its power of reasoning."

Thus it was, no doubt, in the case of this experiment with the tin tube. The lecturer saw clearly that the "result" of extinguishing the candle by a "sound-pulse" was in perfect accordance with the wave-theory, and his "desire to establish" that result destroyed, for the time, his "power of reasoning," and led him to clap the books together in just such manner as most certainly and effectually to force air into the tube and thus "blow the candle out," while actually denying in the same breath that he *blew* it out, since *no air passed out of the tube!* No one who had not been, for the moment at least, deprived of his reasoning powers, would have taught such nonsense as *blowing* a candle out without a puff of air or some other substantial fluid. But Prof. Tyndall so taught, which proves that his own solution of the puzzle is the correct one.

He next proceeds to convince the audience of scientific students that the explanation he had given them was beyond question the correct view of the experiment, and that it was the sound alone which had caused the candle to "duck." To prove positively that he was right, and that no air passed out of the tube, he put *smoke of brown paper* into *one end of the tube*. But here, again, under the warping influence of the theory which required such doctoring of facts, he lost his powers of reasoning, and actually put the smoke into the wrong end of the tube, (or rather, into the right end for his purposes), as he must have known, had his reasoning powers not been destroyed, that the smoke would have been ejected every time the books were clapped together, if it had been put into the small end!

Still, we are disposed to be lenient and charitable toward a brother investigator, and will insist, notwithstanding this unfavorable aspect of the case, that the Professor was not knowingly dishonest, in the wicked sense of that term, and that his words just quoted (though evidently not intended when written to apply to his own case) form the correct apology for those ridiculous misrepresentations of scientific facts. If this quotation does not give the true solution, then we confess our inability to aid the Professor in his pitiable dilemma, and can only tender him, in the generosity of our nature, the unlimited use of these columns in which to set us right. We feel certain that our

readers will be only too glad to welcome Prof. Tyndall as a contributor to *The Microcosm* in defense of himself and the wave-theory of sound; and surely that eminent physicist can not afford to let this thing go on much longer in the way it is now going, if he values, the worth of a penny, his scientific reputation.

In the next number of *The Microcosm* we will consider the law of *interference* in so-called sound-waves, in which it is claimed, according to the wave-theory, that two systems of sonorous undulations may so travel together as to neutralize each other and produce "absolute silence."

THAT \$1,000 CASH PRIZE.

THE readers of *The Microcosm* will recollect that Mr. Joseph Goodrich, of No. 15 Park Row, this city, offered in the September number of our paper \$1000 in cash to any professor of physics who would refute the arguments against the wave-theory of sound advanced by the author of *The Problem of Human Life*. Mr. Goodrich has just informed us that but one man, thus far, seems willing to undertake the task, and that is Prof. La Roy F. Griffin, of Lake Forest University, Ill., who writes in order to make arrangements for the appointment of judges, umpire, &c. Mr. Goodrich replied, informing him that he would leave it to any school-teacher in the State of Illinois, and would make the task very light on the Professor, as he would pay him the \$1000 as soon as he produced *silence* by sounding two unison instruments half a wave-length apart, as the wave-theory positively tells us will be the result. This answer was sent more than a month ago, but no further word from Prof. Griffin has come to hand. It is supposed that since receiving this liberal offer, the Professor has concluded to post himself a little by reading *The Problem of Human Life*, a thing he evidently had not thought of before writing his letter. He is now, no doubt, satisfied to shun notoriety by not entering the lists for the glittering prize.

A SCIENTIFIC GRUMBLER.

WE are amused at the intellectual contortions of a certain "J. S. P.," in a communication to the *Add Ran Student*, grumbling at our explanation of the hoop-puzzle in the September number of *The Microcosm*, and at his not receiving the prize. Those who have read this effusion in the *Student* need not wonder that its author should complain. He proves beyond a doubt that he does not know the dif-

ference between giving a scientific reason why a hoop does not fall while rolling, and a long argumentative explanation to show that a hoop may be so broad on its face, and so accurately poised over its center of gravity that it will not fall when it stops! Really, three-fourths of this communication is devoted to something not in the puzzle at all, since every child knows that a *barrel* (which is nothing but a hoop with a broad face) will not fall over on its end when it stops rolling! We remember his solution (!) when it was received, and the ludicrous impression it made on our mind. No wonder "J. S. P." gets riled, and threatens not to send a solution to the top-puzzle! He had better let puzzles alone.

THE GYROSCOPE.

THIS philosophical instrument, the invention of M. Foucault, has been the subject of much scientific discussion. There is scarcely an encyclopedia which does not contain lengthy articles on this instrument, variously explaining its peculiar motions. Yet the gyroscope is almost no invention at all when we come down to its real merits, since the ancient *top*, which was well known thousands of years before Foucault was born, has the same peculiar motions, as fully set forth in the statement of the *top-puzzle* in *The Microcosm*. We have only to suspend a common top, while spinning, by the pivot with a thread, and these same gyratory motions are even more plainly manifest than when spinning the top in the usual way. Gyratory tops of this kind have often been sold on the street. But one has only carefully to observe a common toy-top, as spun on the floor by a child, and witness its accelerating gyrations and its tendency to rise, to see that very little invention is observable in the so-called gyroscope of Foucault over what has been observed by children ever since Noah was let out of the Ark. Yet these peculiar motions have never been philosophically and intelligibly explained.

MICROCOSMIC DEBRIS.

At Pompeii combs have been found exactly like the modern fine-tooth kind.

France is now building 17 ironclads, England 10. This will give France 53 and England 58.

The war-ships of Chili and Japan are almost the only ships generally armed with the most effective modern ordnance.

Dr. Maudsley, the eminent English neurologist, says that "the true site, seat or organ of the mind, is the whole body."

There are 163,293 more Baptists in this country than there were last year. The present total is set down as 2,296,327.

A steamer has been specially fitted to raise the German ironclad Great Elector, now 90 feet under water off Folkestone, England.

It appears by an official return just published that the German imports for the year 1880 were worth \$719,000,000, and her exports \$774,875,000.

The ordinary country house in Arkansas is a log cabin; in Kansas, a dugout in the prairie; and in Nebraska, a sod house built of square pieces of sod.

The Baptist Home Missionary Society wants to raise \$500,000 as a jubilee offering to mark its semi-centennial year. Some of the rich Baptists favor this project.

At the recent fires in Michigan the heat withered the leaves of standing trees two miles away from the fire; and seven miles off the beach at Forrester sailors found the heat uncomfortable.

Vaccination is making gradual headway in China. The people of the interior detest the outside barbarian, but have a still greater dislike to the disease, which carries off whole tribes of them.

The number of insane persons in the United States is put down by experts at 100,000; and the same authorities say that from ten to twenty per cent. are curable by present methods.

One of the sights of Milan just now is a petrified human body, which has been prepared by a Dr. Comi.—the process is a secret one,—and is exhibited in the Salle Villa, Via Pasquirolo.

Mussulman pilgrims now go to Mecca by Mediterranean steamers, instead of making the long caravan trips. But the greater the fatigue incident to the land trip the more pleasing is the devotee in the sight of God and Mohammed.

The Afghan war cost the lives of 99 officers, and 1,524 men, besides 111 officers, and 1,252 men wounded. The various South African wars cost the lives of 172 officers, and 3,028 men; 162 officers and 2,016 men were wounded.

Lord Clandeboye, the eldest son of Lord Dufferin, swam across the Bosphorus, from Therapis to Beicos, in a little over an hour,—a swim considerably longer than that from Sestos to Abydos, accomplished by Leander and Lord Byron.

A great clothing-house at Paris exhibits several sewing-machines which move by electricity with wonderful speed and regularity. The establishment uses them for its own sewing,

and thereby greatly lightens the task of the hard-worked seamstresses.

A frightful epidemic of typhoid fever has been raging at Athens. Ten thousand persons, or a tenth of the whole population, were attacked by it, and all who could get away fled from the city. The probable explanation of the outbreak is some pollution of the Athens water, which is at all times of bad quality.

An English contractor lately stated that some frontage ground in the city of London had been sold at the rate of a million sterling the acre. Some ground has just been sold for the erection of the new Post-Office, at 3,378*s.* the square metre (about ten square feet) the highest price which has yet been paid for ground in Paris.

The house at Duxbury, Mass., built by Miles Standish's son Alexander, is still standing, and contains many of the old timbers saved from the fire, when the house built and occupied by the doughty Captain Miles himself was burned in 1665. The grave of the Captain at Duxbury has long been obliterated and forgotten.

The life that is devoted to knowledge passes silently away, and is very little diversified by events. To talk in public, to think in solitude, to read and to hear, to inquire and to answer inquiries, is the business of a scholar. He wanders about the world without pomp or terror, and is neither known nor valued but by men like himself.

A new lighthouse in which the electric light is to be used, has lately been completed at Marseilles. The cost of the light is seven times less than the cost of that which it will replace. The new lighthouse will be one of the finest on the French coasts. The light, which will be equal to 3,500 gas jets, will be visible at a distance of twenty-seven miles.

The *London Lancet*, in speaking of church bells, says: "They are an intolerable and most mischief-working nuisance. To the sick their ding-dong and jangle are a serious annoyance; and we do not hesitate to say that in many cases the loss of rest and general disquietude they produce not only lessen the chance of recovery, but may expedite a fatal issue."

The Calcutta Tea Syndicate, which was established last year for the purpose of opening up the Australian and American markets to Indian tea, has published a report which shows that its operations have been attended with very great success. The amount of last season's Indian tea exported to Australia was 621,128 pounds, against 86,628 in the previous year.

In order that the rising generation of men in

France may be instructed in rifle practice before they enter the army, a sum of 1,000,000 francs is to be applied by the Minister of War to the purchase of guns for the use of boys in elementary schools. These arms will be similar to the regulation army rifles, but of course, lighter. Each school is to receive three, of which one will be especially adapted to being taken to pieces for the practical teaching of the principle and construction of firearms.

A man attempted to cross Caddo Lake, Texas, in a skiff containing a quarter of beef, when he was hotly pursued by a school of alligators. Eight of them tried to upset the boat, but by hard rowing the boatman reached a cypress tree, seized it, and abandoned the skiff. The next day two fishermen, who were crossing the lake, heard his cries and went to his assistance. The alligators attacked the rescuers; but by a dexterous use of their oars, and a double-barreled shotgun, they succeeded in keeping the enemy at bay until the unfortunate man, more dead than alive, could be got out of the tree and rowed safely to shore.

The engineers employed by Gen. Turr to make a preliminary survey of the Isthmus of Corinth, have decided in favor of the ancient cutting commenced by the Emperor Nero at the western end of the Isthmus. Gen. Turr is of the opinion that by following this line the company will save a million dollars. The opening of the canal will be a great boon to travelers.

M. Cochery, the French Minister of Posts and Telegraphs, is organizing a system of movable or "flying" post-offices. These establishments are so constructed as to be capable of being moved from town to town, and thus any temporary strain upon the resources of the post-office, particularly during the season at the different watering-places, will, it is hoped, be promptly met.

Acting on a theory that human beings were made to stand upright, and ought never to lie down, a Californian sleeps in an apparatus which sustains him comfortably in a perpendicular position. A Nebraska physician is equally certain that the vital organs are injuriously affected by being jolted downward in walking, and to counteract this he stands on his head five minutes every day.

A quantity of bees, destined for Ontario, were recently received in London, from Cyprus. They were let out near London for a fly, and afterward repacked for the remainder of their journey. They were conveyed in small boxes, partly covered with perforated metal, and provided with honey and water. A similar con-

signment of this unusual freight was successfully forwarded to Canada last year.

Tennessee has added to her industries that of pearl-fishing, in which five hundred people are engaged on a single river. The pearls are found in mussels; and no doubt the mussels of other rivers will also be ransacked for jewels. Boys have always had great faith in the pearl-bearing properties of mussels, as, indeed, of all other shells; and have been willing to show their faith by constantly wading for them.

No man who has reached the age of three score and ten, would, upon reflection, be willing to rub out from his experience in life the sorrows which have softened his character, the mistakes which have taught him wisdom, or the wrong-doings which he has ever regretted, and which by their influence have made the golden threads which it is reasonable to suppose have been formed in the texture of his moral character.

The action of the French Col. Negerier in destroying the tomb of Sidi Cheik, is approved in Algeria, and a subscription is being raised to present that officer with a sword of honor. Outside the colony, however, his course is generally condemned. "Never," says the Paris correspondent of the *London Telegraph*, "was a more wanton or foolhardy deed committed than the desecration of a shrine that was held in the utmost veneration by the entire Mohammedan world, and which was visited by pilgrims."

There hangs in the dining-room of the Cottingham House, Northamptonshire, England, the residence of the Hon. Mrs. Pery, a lifelike picture of the beautiful Viscountess Cullen, who married at the age of 14, her husband being 16 or 17. The peculiarities of the picture are that the lady is represented reclining, accompanied by a pair of doves, in the happy state of Eve prior to the fall. It has consequently been found expedient to provide petticoats for the Viscountess in the shape of curtains. The picture is by Sir Peter Lely.

What are the changes going on in the heavenly bodies, or in our atmosphere, or in the illimitable space which lies between us and the stars, whereby a change in their color is observed? Sirius was described as a fiery red star by the ancients; some years ago it was a pure white, while it is becoming now of a decided green color. Capella was also called a red star by the ancients; it was afterward described as a yellow star, and is now bluish. Many other instances of change of color, though less decided, have been detected.

The venerable Stockton mansion, at Princeton, N. J., the ancestral home of Commodore

Stockton, is now owned by his kinsman, Mr. Samuel Stockton, who is married to a great-niece of Benjamin Franklin, and worthily maintains the place. The beautiful old trees which line the road in front of it are one of the chief ornaments of the town. The Potter estate, with its very fine house, is now the residence of Dr. McCosh, having been bought as the official abode of the President of the college, but both within and without it is miserably changed in appearance from the elegant place which it was, when maintained by a wealthy family who knew how to live.

A wren built her nest in a box on a New Jersey farm. The occupants of the farmhouse saw the mother teaching her young to sing. She sat in front of them, and sang her whole song very distinctly. One of the young then attempted to imitate her. After proceeding through a few notes, its voice broke, and it lost the tune. The mother immediately recommenced where the young one had failed, and went very distinctly through with the remainder. The young bird made a second attempt, commencing where it had ceased before, and continuing the song as long as it was able; and when the note was again lost, the mother began anew where it stopped, and completed it. Then the young one resumed the tune, and finished it. This done, the mother sang over the whole series of notes a second time with great precision, and a second of the young attempted to follow her. The wren pursued the same course with this as with the first; and so with the third and fourth. This was repeated day after day and several times a day.

A case of prolonged somnolence, that may serve as a companion-piece to that of the sleeping Hungarian in Pennsylvania, is reported from one of the hospitals of Niederwisel, in Germany. The twelve-year-old daughter of an innkeeper fell into a deep trance in March, 1880, and continued in that condition for the remainder of the year. She was carefully observed by physicians and nurses in the hospital to which she was removed, and there can be no doubt as to the authenticity of the statements made in regard to her. No medicine was given her, and the small quantities of nutriment that was prescribed had to be administered by forcing her mouth open. She had normal sleep at night, but during the day lay wholly motionless, and apparently without sensation or consciousness. At first much emaciated, her appearance subsequently became fresh and healthy. About the beginning of the present year she suddenly recovered her power of speech, and was soon wholly restored in other

respects. She is now entirely well. It is also said that during the whole period of her suspended animation, she was fully cognizant of every thing that took place about her.

Signor Giovanni has undertaken to restore in England the lost art of engraving on glass, called by the ancients "the art sublime." But one specimen of this wondrous art exists in England—the Portland vase at the British Museum. Signor Giovanni has produced a drinking-vessel of thick glass, out of which he has sculptured in bas-relief, a group representing the training of young Bacchus. Some idea may be formed of the perfection of this *chef d'œuvre*, when it is observed that the different figures, though but two inches in height, are executed with such minuteness of detail that they appear twice as big. It has been purchased for the King of Italy for \$25,000.

Prince Frederick, of the Netherlands, whose death was lately announced, was one of the soldiers of Waterloo. During the battle he was stationed with 18,000 men to cover the Duke of Wellington, and protect Brussels in case any sudden turn that way should be made by Napoleon. There are not many survivors of those days now. The Emperor William of Germany is one. He took part in the campaigns against France, even earlier than the Dutch Prince who has just died. The Emperor was in the field in 1813, and entered Paris in 1814 with the conquering allies. He is a month or so younger than Prince Frederick of the Netherlands was; both were born in 1797.

Few people know that in bad seasons honey is apt to be poisonous. This arises from the fact that in such seasons the bees are often obliged to gather it from poisonous flowers. Great care should be taken to remove all poisonous plants from the neighborhood of the hives. A specimen of honey from Trebizond, gathered from the *rhododendron ponticum*, which is common in that neighborhood, was sent in 1834, by Mr. Keith E. Abbott, to the Zoological Society of London, and in 1859 it still retained its poisonous qualities. In 1790 a great many people in Philadelphia died from eating honey gathered from the flowers of the *kalmia latifolia*. In good seasons the bees avoid poisonous plants.

The city of London churches are to be reduced one-half. Within an area of a little more than half a square mile, designated as "London Within the Walley," there exist no less than forty-eight churches, which, with St. Paul's, are capable of accommodating 40,000 persons. The resident population within this area has diminished to 20,000 persons, and the attendance at all the churches, including

St. Paul's, is not above 10,000. It is proposed to retain only twelve of these churches, and to sell the thirty-six remaining, by which it is expected at least a million sterling will be realized, and made useful for the erection of fifty other churches in the more remote parts of the town and its suburbs.

The oldest medical work extant is a roll of papyrus obtained by the celebrated German archæologist, Ebers, in Egypt. He was traveling in that country a few years since, and learned that a papyrus roll had been discovered lying by the side of a mummy. After considerable difficulty he became possessed of it. It is about eleven inches wide and sixty feet long, and is in excellent preservation. It was written 1522 years before the Christian era, when Moses had just reached his twenty-first year. The author is believed to be the great Thoth, who was deified by the Egyptians on account of the civilization which he brought them. It is the intention of Ebers to make a complete translation of this work.

Vast and destructive grasshopper swarms have been ravaging parts of Turkey, and of the Russian Caucasus. In the latter region 100,000 roubles were appropriated for distribution in the shape of rewards for the destruction of the larvæ. In the region about Smyrna, the entire population had to turn out for the destruction of the pests. In the district about Angora all shops were closed by proclamation of the Governor for three days, and the population was set to work in the fields. Besides this, prayers were offered in all the mosques, and every inhabitant was required to turn into the Government a certain quantity of the larvæ, to be burned in pits dug for the purpose. These grasshoppers, or locusts, are said to come from Persia.

The immense fans suspended in the great hospital at Madras, India, for the purification of the air, the movement of which has hitherto been by hand, are now operated by steam power, the substitution being both effective and economical. The machinery by which this is accomplished is quite simple, all of the fans in the great establishment being pulled by a steel wire line some 2,700 feet long; that is, the whole number of fans—100,* representing a total area of 2,050 feet—are all pulled as one pendulum, giving a swing of seven or eight feet, smoothly, steadily, and without noise of any kind. The long swing and uniform continuous motion produced by this arrangement insures the desired change of air, without occasioning a draught.

The multiplication of religious sects in the West keeps pace with the progress of the age

in other industries. One of the latest sects is called "The Dreamers." The persons who compose it consider dreams to be divine revelations, and therefore they shape their actions according to what they think they learn in the silent watches of the night. When they dream dreams which they cannot understand, they go for explanation to the "Chief Dreamer," who is the head of their sect, and who either explains them or pretends to do so. The influence he thus acquires over them is very great, as he becomes acquainted with their inmost personal and family secrets. The sect is not, as yet, very extensive, but its members make up for the lack of its size and influence by intense ignorance and unquenchable stupidity. It has its headquarters in a small town in Minnesota, to which it probably will be confined.

There is a Sleepy Hollow in the Catskills which is regarded, no doubt correctly, as the spot where Washington Irving located his legend of "Rip Van Winkle." It is a wild and highly picturesque gorge, with its open end overlooking the valley of the Hudson, and the other extending up between two high mountains. The precipitous road to Catskill Mountain runs through it, and a tavern affords beer and luncheon to excursion parties. The path taken by Rip in his memorable tramp is pointed out, of course, and a rough one it is, following the stony bed of a creek; also the amphitheatre in which Hendrick Hudson's men rolled tenpins, the rock on which Rip met the fellow with the keg of schnapps, and the tree under which the twenty years' sleep was taken. The visitor may be fortunate enough to hear some thunder, which reverberates among the mountains exactly as the noise of tenpin-balls might if they weighed a ton and were rolled in an alley of corresponding size. But there is an irreverent guide there, who, in moments of confidential intercourse, expresses a belief that the Rip Van Winkle adventure never happened.

Two comets are now approaching the sun, Encke's, which is no stranger, as it revisits us every three and a half years, and the new one discovered in the northeast on the night that President Garfield died. Neither is yet visible to the naked eye. Encke's rarely becomes bright enough to be seen without a telescope, but the new comet has possibilities. It would not be unprecedented if we should have two brilliant comets this year. Two of the grandest comets on record appeared in the year 1402. At the very time that the enormous comet of 1618 was scaring Europe, another huge comet was visible in the southern hemisphere. It is also a mistake to suppose that 1881 has furn-

ished an unprecedented number of comets. Only four new comets have been discovered this year. In 1858, the year of the great comet, no less than eight comets were seen, of which six were new ones. In 1848 there were nine comets visible, of which eight had never been seen before. There have been many years in which four and five comets have been seen. So, whatever may be claimed for 1881 on account of its other marvels, it certainly does not take a front rank as a comet year.

Rarely has any literary undertaking been pursued with such perseverance and industry as were bestowed by Littré upon his great dictionary of the French language. He is said to have worked upon it every night, for years, until three o'clock in the morning. The printing began in 1859, six years before the work was completed, and lasted until 1872, with two interruptions, occasioned by the outbreak of the war between France and Germany and by the Commune in Paris, the one lasting about seven months, and the other two. The printing was resumed before the reign of the Commune was over, and the proof-sheets were allowed to pass through the German lines from Paris to Versailles, where Littré was staying, and back. Littré was a member of the Chamber of Deputies, and is described as working placidly at his proof-sheets in his seat in the Chamber, amid the most violent and exciting scenes and debates. During the war with Germany he deemed it prudent to make a hasty retreat from the country house where he lived, upon the approach of the hostile army. During his absence the German troops entered the house; but upon his return he found that nothing had been taken away, and that his fine library was uninjured.

King Alfonso, of Spain, had a very dreary childhood. Professors tried to drill every human science and some nine or ten languages into the child's head. There was always an excuse, as he dolefully observed, for making him learn something new. "That revolution of 1868," he said, "gave me my first holiday." He laughed, but it was a fact. His mother had a little more time to look after her son, and was wise enough to see that he had been over-crammed. Thenceforth he was allowed to take things more easily. A gentleman who called upon Alfonso the day after he was proclaimed king was favorably impressed by the lad's demeanor and general intelligence. He seemed a little shy, and was evidently taken by surprise when knelt to, and hardly expected to have his hand kissed. But he soon recovered himself, and talked the political platitudes of a well-trained boy. At the moment the

great news was brought to him he was reading in the original Macaulay's Essay on Clive. Close beside him was a treatise, just laid aside, on fortification. Since then he has had scant leisure for books, but has profited immensely by the practical instruction in political science which the past seven years have brought him. Like his mother, he is fond of authority.

There is something startling in the way the country catches fire in a long drought. After a few weeks' deprivation of rain, fires start up in the woods and dry meadows on all sides, the sun shines red and dim, and the choking smoke extends even to the seashore, and pours through the city streets and into the open windows; the soil itself, penetrated in every direction by vegetable fibers as dry as tinder, smoulders and burns, and the progress of the flames through great forests is marvelous in its rapidity. Settlements in wooded regions are quickly surrounded by the advancing fire, and the inhabitants have to work day and night to save their homes. Farm houses are in the same peril, live stock is burned to death, the harvests are destroyed, and sometimes human lives are lost in the sweep of the flames. The earth seems turned into a tinder-box, and the use of fire for any purpose becomes dangerous until the rains return and soak the ground, extinguishing the last spark. Such a picture reminds one of a traveler's story, and yet it only describes what has recently happened in New Jersey, in Pennsylvania, in Northern New York, and in Canada. After all, no comet is needed to burn up the world. Only let the rain be withheld long enough, and the whole earth would of itself start into a blaze from ocean to ocean.

Selling a church "short," and afterwards taking it in again at a lower price, seems more like a Wall Street transaction than an ecclesiastical one. Yet the Congregational church, in Patterson, N. J., seems to have done something of this sort, in a perfectly legitimate manner. These good people had a church, and yet had it not, for it was so heavily mortgaged that it practically belonged to the creditors. So, after struggling along with it for seven years, they sold it to the creditors in 1877. Since that time they have, until a few weeks ago, been short of a church, and have worshipped in anything that came handy. The corporation which took the building at \$50,000 is a worldly one, which has no use for church edifices. Therefore, after holding the property for a while, and finding no sale for it at anything like the cost price, this carnal corporation concluded to let it go at any reasonable offer. By this time the Congregationalists were able to raise \$15,000, so they made an offer of

that much. The offer was accepted, and now the church has taken its old building in, having made \$35,000 and four years' interest by the operation. There are many mortgaged churches which might thus profitably "go short" on buildings, but for the possible risk that some other church might come along with cash and scoop in the property. A very nice question now arises as to whether or not the Congregational church building at Patterson should be dedicated anew to the service of God.

Appropos to the foregoing, the following might be considered as an addendum:—An eastern church is credited with taking its building fund into Wall Street, recently, and increasing it from \$40,000 to \$125,000. The new church will have all the latest improvements, and a big steeple, and will be known as the "Church of Saint Paul, preferred." But another Eastern church tried the same plan, and got caught on a bear market. They have concluded not to build just now, but to get along with the old church for the present.

THE IMMORTALITY OF THE SOUL.

BY REV. E. H. VAUGHAN, B.D., PH.D.

PAPER I.

PHILOSOPHERS of different ages have held strange and contradictory views in regard to the soul,—its nature, origin, and immortality. Pythagoras taught that the soul is a harmony based on numbers,—that it consists of two parts, one of which is rational and immortal, and the other sensual, irrational, and mortal, both of which are united in man, being imprisoned in the body as a punishment for former misdeeds.

Philolaus taught that the body is both the organ and the prison-house of the soul; and that the two are harmoniously united by means of numbers.

Lenappus and Democritus were the founders of the Atomic Philosophy; and taught that fire and soul are composed of small round atoms that have an eternal and uncaused existence; that sensation comes from outward objects, and reaches the soul through the physical senses; that these fire or soul atoms permeate the whole body, but exercise peculiar functions in the different organs; that in breathing we inhale and exhale these soul-atoms from the air, and that life lasts only so long as this double process continues.

Critias taught that the soul originates and resides in the blood.

The theory of Plato was that there is a world-soul which was created from three elements, one of which is neutral and intermediate be-

tween the other two, that are opposite and opposing,—the first being indivisible and immutable, and the third divisible and mutable, but the three are harmoniously blended and distributed throughout space. The human soul was made like the world-soul, having a divine element, whose seat is in the head,—the other two parts, rational cognition and sensuous perception; and combined with this are two other souls, which he describes as being pre-existent, yet confined to the body and mortal. One of these is the appetite-soul, which he defines as the disposition to seek after sensual enjoyment and the means of obtaining it; the other is the courage-soul. These three taken together bear the relation to each other of a driver and two steeds. The first of these three only is immortal, and is subject to transmigration. Plato founded his doctrine of immortality principally on the nature of the soul as containing within itself the essence of all motive power, again on the supposition that moral evil, which is its greatest enemy, cannot destroy it; and hence nothing else can. Again, on the fact of God's goodness, and the supposition that He cannot or will not destroy that which is so admirably wrought together. Then on the desire of the soul for a future incorporeal existence, and its relation thus both to the visible and invisible realm, he argues further that the soul is necessary to the idea of life, that a dead soul is a contradiction, and hence immortality must be predicated of it.

Origen taught the pre-existence of the soul, and that it was sent into the body as a punishment for former misdoings.

The soul was defined by Spensippus as having form and extension, being proportionately shaped into a mysterious harmony with numbers, and that its vital force constitutes the entelechy of the body, which exists only for its service.

Aristotle taught that there is an intellectual element in the soul which existed before the body, and hence had a divine origin and is immortal; but that it contains other parts which are common in other orders of existence; that these may be separated from the first and are perishable, but while connected together and with the body constitute a perfect harmony.

The Stoics taught that the soul is a part of or an emanation from Deity, but exists in us as a warm breath; that it outlives the body, but yet is perishable, and will endure only so long as the world-period in which it exists. They did not suppose it to be a unit, but that its parts were the five senses, together with the faculties of speech and generation, which were controlled by a mysterious and governing power situated in the heart.

Epicurus taught that the soul is a material organism composed of exceedingly fine atoms, which are nearly related both to fire and air, and that it is distributed through the whole body, but that its rational part is located in the breast. He taught that something cannot come from nothing, and that existence cannot become nonexistence, and hence its immortality.

Plotinus taught that the body is in the soul, and depends upon it for existence; and that the soul is separable from the body, and both precedes and survives it. That the soul is the image of intelligence, as intelligence is the image of God; and being only the image of intelligence, is inferior both in rank and character, yet none the less really divine, and contains a generative power; that it proceeds from the intellectual and begets and permeates the corporeal; that there is in existence a plurality of souls, the highest and most noble being the world-soul, of which all others are only parts.

Tertullian taught that the soul proceeds from the Father, as does a shoot from the parent stock; that all souls have proceeded from Adam, and that with each the spiritual quality of the Father is transmitted.

Lactantius taught that the soul can exist apart from the body, and will continue to live after the death of the body, since it partakes of the nature of God, who is incorporeal.

Gregory combats the pre-existence of the soul, and argues that the soul and the body came into existence at the same time, yet the soul may outlive the body, and gather again its scattered elements. He teaches that the soul is immaterial, since it has the power of thought, which is not an attribute of matter, and that it resembles God as a copy resembles the original.

Augustine taught that there are two deaths, —one of the body when the soul quits it, and the other of the soul when it abandons God. This is not cessation of existence, but of that life that comes from God.

Nemesius taught that the soul is an immaterial substance, and the product of self-produced motion; that it had a pre-existence, and that no new souls are coming into being. He rejected the theory of the world-soul, and also that of transmigration.

Claudianus Mamertus taught that the soul is immaterial, and subject to changes in time but not in space; and that it has magnitude only in respect to virtue and intelligence.

William of Avergne taught that intellect is an essential element in the soul, which is related to the body only as the harp is related to the harp.

Albertus Magnus taught that nothing can belong in common both to God and His creat-

ures, and hence past and future eternity can not belong to both; but by virtue of relation to God every soul may become heir to immortality.

Thomas Aquinas taught that the immortality of the soul follows from its immateriality; and hence that it cannot destroy itself, or be destroyed by dissolution. He held that it did not have a pre-existence, and therefore could not have acquired its ideas from a previously existing state; and that in it several faculties are united, although they differ from each other, as unity, love, truth, and virtue.

William of Occam taught that the soul is a substance, separate from the body, and yet present in every part; and he established his doctrine of separate existence on the antagonism between sense and reason.

Eckhart taught that the soul is unity in its essence, and yet contains the faculties of memory, reason, and will, which bear the same relation to each other as do the Father, Son, and Holy Ghost; that reason is the supreme faculty of the soul, and knowledge the ground of blessedness; and that when it leaves the body it becomes absorbed in God and a part of Him.

Descartes taught that the soul and body are connected together at a certain point in the brain; that they act and interact, and are mutually dependent one upon the other.

Locke taught that the soul is originally as a piece of white paper, having no ideas of its own, and that it afterwards acquires them through experience, from whence all knowledge comes. He considers the brain the seat of consciousness, and calls it the audience-chamber of the soul.

Leibnitz taught that the soul's power to act proves it to be a substance; and that it is the ultimate analysis of the bodily substance.

Condillac taught that the soul dwells only in thoughts that are agreeable to it.

Kant sought to demonstrate that the soul exists in space, but not in time; and that it is an incorruptible, immaterial, intelligent substance, endowed with personality.

Herbart taught that the soul is a simple essence; that it exists independent of space, and yet is located at a single point in the brain, where it is penetrated by surrounding substances, and that its ideas endure after the occasion that calls them forth has ceased; but that since opposing ideas can not exist in harmony, some are partially arrested, so that the soul becomes unconscious of their existence.

Trendelenburg defines the soul as being a self-realizing final ideal; that it is hence not a result, but a principle, and that man is elevated above the brute by his power to think.

Beneke's definition is that the soul is an im-

material being, consisting of certain fundamental systems or forces, which are combined so as to constitute one personality.

Ulrici held that the soul exists as a center of vital forces, and that it is a kind of fluid similar to ether, yet not consisting of atoms; that it extends out from a given center; and that co-operating with and constituting a part of the vital force, it so permeates the whole atomic structure as to produce physical life.

Wagner also defined the soul as being a kind of ether in the brain. He ascribed to it a future existence; and postulated future judgment and retribution on the basis of moral order in the world.

Sir John Davies held that the soul is a spirit; that it is not produced, but created; and that it is united to the body, not as a harp to the harp, but that it is diffused through and permeates the whole body.

Henry Dodwell endeavored to prove that the soul is naturally mortal, but rendered immortal by union with the spirit in baptism.

Galuppi taught the unity, simplicity, individuality, and immortality of the soul.

Rosmini affirmed the existence of a universal soul in Nature, one in itself, yet multiplied and individualized in creatures.

That the soul, though dwelling in the body, is yet a part of and an emanation from God is an opinion that runs through much of the Greek Philosophy, and is even more ancient than this.

The doctrine of immortality has been held and taught in some form by all the heathen nations. We find it in the Hindoo Vedas, in prayers like the following: "Oh, Maruts, may there be to us a strong son, by whom we may cross the waters, on our way to the happy abode." And in this: "Where there is eternal light, in the world where the sun is placed, in that immortal, imperishable world, place me, oh Soma." "Where King Vivasvati reigns, where the secret place of heaven is, where the mighty waters are, there make me immortal: where the sum of our desires is attained, there make me immortal."

The doctrine was implied among the Chinese in the worship which they paid to their ancestors, and in the fact that when one died they said, "He has gone to his family."

It existed also among the Egyptians, who taught that after death Osiris, the judge of men, weighs their hearts in the scales of justice, and sends the wicked to a world of darkness and the good to dwell with the god of light.

The Persians taught that he who lives in purity passes at death into the world of light and leisure. And among all the uncultured

tribes we find expressions of this doctrine, which are more or less vague and imperfect.

Having now threaded our way through these mazes of ancient lore, we will look out from the standpoint of reason, and see if we can answer the question, Is man immortal?

CAUSE AND EFFECT.

BY PROF. I. L. KEPLAET, A. M.

God governs the universe by immutable laws. These laws permeate all creation. In obedience to their mandates vapors rise and rain falls; winds blow, and frosts congeal; atoms cohere and planets whirl; and behind it all stands the Omnipotent, Omniscient One, whose behests these laws execute, evolving from this vast, intricate machinery the greatest possible good to the greatest possible number.

In the happening of all events, careful observers have noticed the workings of the invariable law of Cause and Effect. Each effect always has its corresponding cause; and each cause *must*, invariably, produce its corresponding effect. The Infinite God is so unchangeable, so reliable, that whenever we see a cause set in motion and clearly comprehend it, we know at once what the effect will be. The Creator has endowed man with the ability to comprehend causes. He has also given him the power to set causes in motion, and the privilege of choosing as to the kind of causes he will set in motion. Herein consists man's supremacy. In this particular—being endowed with this supreme prerogative—consists the fact that he is made in the image of his Creator.

But here man's supremacy ends. Having once set a cause in motion, it immediately passes beyond his jurisdiction into the jurisdiction of God. Man may choose which of two or more causes he will set in motion; but, having made his choice that cause is so indissolubly linked with its proper effect that man can not, and God will not prevent the effect from following. Hence, "Esau found no place for repentance, though he sought it carefully with tears."

The great mistake of mankind is carelessness as to the causes they set in motion. Then, when overtaken by disastrous effects, they expend their tears and energies in bewailing their misfortune or "bad luck," and in imploring Divine Providence to interpose a miracle and save them from the causes they have wilfully or carelessly started. This is supreme folly. A farmer carelessly sows bad seed. When the stalks begin to shoot, he discovers that it is cheat instead of wheat. No matter how reverent and pious his life may have been, it is

now too late for him to pray, so far as changing the result is concerned. The seed has been sown, the cause has been set in motion, and the effect will follow. The result is a crop of cheat instead of wheat.

A father and mother are careless in the training of a darling boy. They keep wine in their cellar, place it on the table at the evening meal, pass it around at the social gathering, drink it and place it to the lips of the boy on whom they dote with all the pride and fondness of which parents are capable. They are setting in motion a potent cause for evil; they are sowing seed, the fruit of which they little apprehend. Time rolls on, and when, in after years, they see their son wallow in the gutter, and, frenzied with rum, drive his wife and aged parents into the street, they implore the Almighty to interpose and save the idol of their hearts from a drunkard's grave and a drunkard's hell. But, in reply to their importunities, there comes back that wise, inexorable fiat: "Be not deceived: God is not mocked; for whatsoever a man soweth, that shall he reap." And the thoughtful, sympathetic observer, much as he may pity them in their anguish, is compelled to remark: "*They have sown to the wind: they shall reap the whirlwind.*"

One of the great lessons to be learned and taught to-day, is that men should pray for wisdom to set right causes in motion, rather than for God miraculously to interpose and save them from the disastrous effects of malignant causes, after they are set in motion. Let it be distinctly understood that wholly in temporal, and, to some extent, in spiritual affairs, it is too late to pray *after a cause is set in motion*, unless there be some way by which our prayers can set in motion a new cause that will change or annihilate the effect of the previous one. The seed sown must produce its fruit. This is an inexorable law. Hence, the importance of exercising care as to the seed we sow.

This law holds good with nations as well as with individuals. For many years the Great Republic sowed with seeds of Liberty the tares of human slavery. Gradually these tares grew stronger and stronger, until the fruit burst open in a terrible civil war that filled the whole country with death and mourning, burdened it with debt, and, but for the mercy of God and the abolition of slavery—the annihilating of the cause—our whole national fabric, and with it human liberty, would have perished from the earth.

Fifty years ago the spoils system in our politics was set in motion as a cause. As such it has gradually but surely gone on, producing

its concomitant effects, corrupting our social life, and creating an unholy greed for office, until, from our municipal governments, up through our county and State organizations to the very head of our nation, there runs this controlling, besotting influence,—a desire to get at the spoils. This principle has become so arrogant and dictatorial that it assumes to control all the energies of the nation in the interests of rings, cliques, and monopolies. And when the great, noble, God-fearing Garfield—providentially placed at the head of the nation—offered a mild but firm resistance to its demands, this unrighteous principle, this unholy effect of an unholy cause, by the hand of a villainous assassin, struck its blow, and the chief magistrate of the nation fell. This system is the cause: Garfield's death and the whole nation bereaved and mourning is the effect. Would we avoid similar calamities in the future? Then it is for us to see that the causes which produce such effects are speedily annihilated.

When the civil war was upon us—when the assassin had fired the shot—then it was too late to pray that we might be saved from the effects of the causes that were producing them. God's answer was: As with individuals, so with nations; they must reap what they sow. And this will ever be His answer. Hence the propriety of praying for wisdom to set in motion none but right causes.

RELIGIOUS DENOMINATIONS.—No. 5.

THE FREE METHODIST CHURCH.

THIS church was organized very unexpectedly to those concerned in its formation. Among Methodists, none were more loyal—more sincerely devoted to its time-honored doctrines and usages. Till the necessity was forced upon them, not one of them entertained the idea of endeavoring to establish a new denomination.

The abduction and murder of William Morgan, in 1826, by the Masons, stirred up the deepest excitement in Western New York. All the lodges were broken up, and hundreds renounced Masonry. It was generally supposed that the institution had died with Morgan.

After the lapse of years, when these events were apparently forgotten, Oddfellow lodges began to be instituted throughout the country. Masonic lodges were soon after revived. Into one or both of these societies many Methodist preachers were initiated.

At the General Conference of the M. E. Church, held at Buffalo, N. Y., in 1848, Rev. E.

Thomas, a leading member of the Conference, handed to each of the preachers, a copy of a pamphlet, written by Rev. C. D. Breslingham, also a member of the Conference, in which the author endeavored to show that these organizations were anti-Christian, and essentially infidel. A violent agitation followed. The result was the formation of two distinct parties in the Conference.

Slavery was the all-engrossing subject of the day. Those opposed to secret societies were also opposed to the continuance of slaveholding in the Church. They were also the advocates of holiness,—of old-fashioned Methodism as it came down from the fathers. They had revivals, favored congregational singing, and endeavored to carry out the discipline in prohibiting worldly conformity. Upon these several issues two distinct parties existed for several years in the General Conference. Each had its adherents and its newspaper organs.

After several attacks from the other party, the Rev. B. T. Roberts published in the *North-ern Independent*, of which he was a corresponding editor, an article entitled "New School Methodism." At the following session of the Conference a bill of charges was preferred against him for "unchristian and immoral conduct." All the specifications professed to be based upon this article. But they charged him with saying what he did not say. They put their own constructions upon his language, and then voted that he wrote what they said he meant. He was sentenced to be reprovved by the Bishop.

After Conference, a prominent layman, George W. Estes, published over his own name, in tract form, the article, "New School Methodism," with a short account of the trial and the names of the men who voted against Mr. Roberts.

At the next session of the Conference Mr. Roberts was charged with "contumacy" in republishing or assisting in republishing the proscribed article. He proved from Mr. Estes that he had nothing whatever to do with publishing it, that he knew nothing of it, and did not contribute anything toward the expense of its publication. One preacher testified that Mr. Roberts handed him a package of the Estes pamphlet, and his testimony was impeached. Mr. Roberts was voted guilty, and expelled from the Conference and the Church.

Rev. Joseph McCreery was expelled at the same Conference for a similar offense.

The next year, four or five preachers were expelled for sympathizing with these men. Hundreds of members were also expelled, or read out as withdrawn, for fraternizing with these expelled preachers.

Appeals were taken to the General Conference. The Constitution of the M. E. Church, in its rules restricting the powers of the General Conference, says that it *shall not deprive the preachers of the right of appeal*; yet the General Conference refused to entertain these appeals.

As there was no other church which held to these issues which they could join, these preachers and members met in Convention in Niagara County, New York, and organized THE FREE METHODIST CHURCH.

In doctrines they hold to the teachings of John Wesley. They give expressed prominence to the doctrine of holiness.

They require their members not to belong to any secret society; to carry out literally the Apostle's injunction not "to adorn themselves with gold, or pearls, or costly array"; to abstain from the use of tobacco; and to consecrate themselves fully to the service of God.

Their government differs radically from that of the M. E. Church. Their Conferences are composed of the ministers and of an equal number of laymen chosen by the several circuits. They have General Superintendents elected once in four years.

All the seats in all their houses of worship are required to be free.

They have thirteen annual Conferences according to the minutes for 1880, and about twelve thousand seven hundred members.

The Free Methodist, a weekly paper, published by Baker & Arnold, Chicago, Ill., and *The Earnest Christian*, a monthly magazine, published by B. F. Roberts, at Rochester, N. Y., are recognized organs of the Church.

They have three Academical Schools—one at North Chili, Monroe County, N. Y.; one at Spring Arbor, Mich.; and one at Evansville, Wis. The Denomination is steadily increasing.

ONE TERRIBLY BEWILDERED.

BY PREST. CLARK BRADEN.

Dear Microcosm: As it seems to be your mission to try and obtain light from those luminaries, modern scientists, will you allow one badly bewildered to ask for light on what is, to him, a very dark subject? I have just read, in "Tyndall on Sound," p. 10, as follows:—

"You have, I doubt not, a clear mental picture of the propagation of sound, from our exploding balloon, through the surrounding air. The wave of sound expands on all sides, the motion thus produced by the explosion being diffused over a continually augmenting mass of air. It is perfectly clear that this cannot occur without an enfeeblement of the motion. Take the case of a shell of air of a cer-

tain thickness, with a radius of one foot, reckoned from the center of the explosion. A shell of the same thickness, but of two feet radius, will contain four times the amount of matter. Thus the quantity of matter set in motion augments as the square of the distance from the center of the explosion. The intensity or loudness of the sound diminishes in the same proportion."

At first this seemed perfectly clear to me. It is similar to the law for the decrease of the attraction of gravitation. A body weighing a ton at the surface of the earth, or 4,000 miles from the earth's center, would weigh only 500 pounds, or one fourth as much 4,000 miles above the surface, or twice as far from the center. The point from which we measure is the center of the earth, or attracting body,—the center of the attraction. The unit of measure is the radius of the attracting body.

Now, by a parity of reasoning, in measuring the decrease of sound-intensity, the point from which we reckon must be the center of the sound-producing body. The unit of measure must be the radius of the sound-producing body. When I turned to Tyndall's illustration, the thought occurred to me that a balloon is not an exact sphere, and balloons may be of various forms. What is the sound-center in each? The center of gravity of the exploding gas? Where is the sound-center in a bell? Where it is struck? Or its center of gravity? Or its geometrical center? If a bell revolves on a wheel, where is the center of sound? The center of revolution, or the point in air where the clapper happens to hit the bell? In the case of the five bells cited by Prof. Noyes, as quoted in the September number of *The Microcosm*, where is the center of sound of the four bells that equal the other bell in sound? Where is the sound-center in a tuning-fork, a horn, a steam-whistle, a cannon? What is the correct center of different sound-producing bodies? Does the form of the body, the way it produces sound, its position, &c., affect the location of the sound-center?

I next inquired, What is the unit of measure? It is the radius of what sphere? How can we find it, if the sound-producing body be not a sphere? In Tyndall's illustration he uses one foot. If his balloon was a sphere, with a radius of one foot, all right. But a balloon is not an exact sphere, may have various forms, and, if a sphere, may have any radius within known ability. What then? In the case cited by Prof. Noyes, the unit around is ten yards. Is that the unit for all bells, regardless of their size and the loudness of the sound they make, or the tone of the bells? What will be the unit of measure in a tuning-fork, a steam-whistle, a horn, a cannon? Will the unit be the same

for all degrees of loudness, all keys of pitch, &c., of sound-producing bodies? Take a monster Krupp cannon, with a bore of two feet in diameter. With a full charge it can be heard across water, when everything is still, over one hundred miles. What is the sound-center? The center of the bore at the muzzle? What is the unit of measure? The radius of the bore? Will the report, at ten feet from the center of the muzzle, be only one hundredth what it is at one foot? At one thousand feet (less than one-fifth of a mile), only one millionth? At one hundred miles, or 528,000 feet, one 278,784,000,000th? Will the unit of measure be the same if the charge be one pound, ten pounds, a full charge,—although the first would not be heard a mile, the second perhaps ten miles, and the last one, one hundred? What is the unit of measure for the decrease of sound-intensity? Is there any natural unit? It occurred to me that perhaps it made no difference what shape the sound-producing body might have, or how the sound was produced, nor what part or how much of the body was affected by the beginning of the sound, nor from how much of the body it proceeded, the sound-wave would assume a spherical form finally. But the query arose, Can this be demonstrated? And how long before it assumes such form? What is the center of the sphere, and what will be the unit of measure of sound-intensity?

I at last thought I had found my way out of the trouble. Tyndall teaches that sound-producing bodies, by explosion, vibration, or in some way, set in motion a wave of air that proceeds from the sound-producing body in all directions. This wave of air striking the tympanum produces the phenomenon of sound. If the theory be true, then, as Tyndall explains in the quotation given above, the mass of air moved by the sound-wave will increase as the square of the distance increases from the sound-center. This is true, no matter whether the radius we use in measuring be the radius of a gnat's eye, or the almost infinite radius of the orbit of the sun in his revolution around his almost infinitely distant center of revolution. If sound be carried by the wave of air proceeding from the sound-producing body as it moves out from it, then as the mass of air increases the sound decreases. So Tyndall declares. Then sound-intensity decreases as the square of the distance increases, no matter what unit be assumed; for the shell of air affected by the sound-wave increases in that ratio, no matter what radius we assume. That is as certain as Tyndall's language means anything. I finally came to the conclusion that I had been foolishly worrying myself for nothing

in troubling myself about a unit of measure. None was needed. Since the law held good for all distances, in regard to the mass in the shell of air moved by the sound-wave, no matter what radius, then it held as good in regard to the decrease of sound, that exactly corresponded to the mass of air moved by the sound-wave. Since one increased as the square of the distance, no matter what distance, so the other, that was produced by this shell of sound-wave, decreased in exactly the same ratio, no matter what radius be used. It mattered not whether the radius of a gnat's eye or the radius of the sun in its almost infinite revolution.

But, then, I rubbed my eyes and asked, Can we assume as a sound-center a new point, and assume all sound to start from that point? Is that true of an explosion? Has it not circumference as well as center? Have not all sound-producing bodies, by the fact of their producing sound, magnitude and dimensions? Is there not a radius, a diagonal, or some such line? What is it? Can it be true that we can assume any unit, in all sounds, no matter what the body producing them? Or how produced? Or the loudness of sound? Or the tone of the sound? No matter whether it be an explosion of a mass of powder that may be ten feet in diameter? Or a steam-whistle, four inches in diameter? No matter if the latter be heard ten times as far as the former? The law and the theory so teach. I respectfully ask information on this subject.

REMARKS.

By what authority do scientists decide to adopt the radius of 4,000 miles—half of the earth's diameter—as the unit of measure in determining the ratio of decrease of gravitation as the square of the distance? This very arbitrary guess involves almost infinite absurdity, because if the center of the earth is to be used as the starting-point in our calculation, we find that gravitation actually *increases* as we recede, beginning at nothing and augmenting to its observed force on the earth's surface, at which point it begins to decrease on some kind of "square of the distance" as we pass upward from this surface. Of course, a body must weigh absolutely nothing at the center of the earth, because it is attracted by the earth's surrounding mass of matter equally in all directions. By what kind of "square of the distance," then, is the decrease of gravitation to be gauged, since it begins at nothing at the center, augments to its maximum on the surface of the earth, then commences to diminish? We thus see that it is all nonsense to talk about beginning at the center of the earth to estimate the decrease of gravitation according

to any imaginable law, since it does not decrease from the centre at all, but proceeds right the other way, increasing for 4,000 miles! Then it is equally guesswork to say that a given body 4,000 miles above the earth's surface is but one-fourth as heavy as when in contact with the ground. We ask for some rational data by which this peculiar unit of 4,000 is obtained. If there be any sense or science in such unit, then *half the diameter* of any sounding body, as President Braden says,—a fiddle-string, for example (one 64th of an inch in diameter)—should be fixed upon as the invariable unit in estimating the ratio of decrease in sound-intensity for such an instrument and not a "foot" as so definitely and elaborately laid down by Prof. Tyndall. The truth is, this whole matter of the ratio of decrease of the forces of Nature, as the so-called square of the distance, is confused nonsense, as now taught by science, and grows out of a mistaken application of the well-understood law that the quantity of air increases as the square of the distance from a central point with infallible certainty, whatever unit of measure be employed,—whether a radius of a million miles or the millionth of an inch. If the attraction of a common magnet does not so vary—"inversely as the square of the distance,"—as so clearly shown in the November number of this paper, it is worse than a waste of time for scientists to try to force this arbitrary law upon gravitation, sound, light, heat, &c.

SEPARATENESS OF MIND AND MATTER.

BY ELDER C. S. TOWNE.

I HAVE been requested to continue the discussion of the points presented in an article entitled "Conscious Existence, Life, and Immortality," in the September number of *The Microcosm*. It is desirable that this discussion should be elemental and complete. I have said that the universe is composed of three substances—matter, soul, and spirit. We see matter presented in two classes,—atoms uniting to form chemical compounds, and atoms again uniting to form organs whose various combinations manifest what is called life.

We do not see soul and spirit as entities separate from matter. Do they thus exist? Or, is the universe composed of material atoms, having a physical and spiritual side, making a double-faced and indivisible unity? If soul and spirit do exist as a compound unity separate from matter, what will constitute an absolute demonstration of the fact? If the materialistic theory be true, and the forces inherent in the spiritual side of the atom be

inseparable, they must, by the very constitution of matter, be inseparable from every aggregation of the atoms, however complex. Any form that should once come to the manifestation of life could never be deprived of the power to manifest life. But we see throughout the whole range of vegetable, animated, and sentient Nature, that all the power to manifest the life-phenomena may be separated from every form, never to return. Every time a plant withers and moulders into the ground from which it sprang; every time an animal breathes its last feeble gasp, and its organism perishes from our sight in the dust; every time a human being in the pride and power of his intellect and will bows to the same inevitable fate,—DEATH testifies that all this life, and energy, and force, are *not* inherent in the matter, are not identical with it; and every budding, blooming, or ripening promise of life is dashed to the ground, and all their potencies vanish from every recognizing sense. The atoms composing the organism are still here; but where is the energy that gave action, and force, and motion to all parts of the once animated form now retrograding to the dust? Do you say that all their energy is annihilated in the moment of death? Here stands the established law of Equivalence and Conservation of Energy, whose foundations are firm as the throne of the eternal God. There is no escape for you here. Do you say the energy has fallen back into the common invisible stock of the universe? What, then, becomes of your position that energy is inherent in matter and inseparable from it? When the energy, force, and motion departed, why did not each ultimate atom also depart with its inseparable quota of these mysterious and subtle qualities? If, on every occasion of death, the whole aggregation of atoms were instantly to dissolve and vanish, there would be some ground upon which to base your hypothesis. But the atoms remain; and the grave, closing over the lifeless, inert body, testifies that the powers of the universe are, in the eternal constitution, something separate and different from matter. Looking from our standpoint at the opposite phenomena of life and death, we know that that which gives all power of action and motion seen in vegetable, animal, and human forms, is always separable from those forms. Standing above all the fluctuating and evanescent forms of matter, upon the unchangeable certainty of the Equivalence and Conservation of Energy, we are sure that there is an unseen something or somebody possessing the power of action and motion, every way superior to that which is acted upon and moved. If there were no

state of death in the universe standing as the opposite of life, nothing beside death could so demonstrate the certainty of separate soul and spirit, leading us into the presence of an unseen and eternal God. As the phenomena of death are opposite to those of life, they sustain the position that life is a state of union. In all the action peculiar to life we see atoms uniting to form cells; cells uniting to form organs; these uniting to form organisms; and with the highest organism, the human, we see united capacities for the exercise of intellectual and emotional powers; and in the progress of time we see additional powers of intellection and emotion uniting themselves to the growing organism through channels of instruction, till the man is seen to stand at an infinite height above all else that we know. But the man passes to the state of death, and all this is reversed. These intellectual and emotional powers are separated from the organism; and then the lifeless structure breaks down and separates back to its elemental atoms, till not a trace of the man remains. It is thus seen that all these chemical compounds, and these organs, and the powers that moved and controlled them, are simply known to have existed in opposite states or conditions, one of union, the other of separation, which could not have been the case had there been only matter in the universe.

Death, then, stands as the chief demonstration in this great question of the separate existence of mind and matter. His skeleton fingers point to an array of facts that touch us on every side, crowding thick beneath our feet, stretching back of all historic ages, and the adamant chain of induction binding us to the inevitable conclusions of his logic can *not* be broken. I, who think, and reason, and will, and act, am one; and this material body of flesh and blood in which I think and act, is something else.

THEORY OF EVOLUTION.

BY PROF. J. SALYARDS, A. M.

THE limited intelligence of man frequently becomes exposed to anomalies most whimsical and strange. It will not be denied that the human mind, naturally finite in all its capacities and powers, is still endowed with restless, insatiable curiosity, with reference to the great mystery of existence. In regard to certain objects of thought, it can and it does conceive with pleasing comprehension the infinity of space, of duration, of eternity, because it feels intensely the necessity of each fact, and the absurdity of rejecting that truth. It is per-

flectly secure in the belief that to speak of adding finite years and centuries to the eternal duration of the past, so as to increase its magnitude, is simply absurd; that in the presence of the infinite all finite magnitudes vanish into nothing; that if we grant a part to be endless, and no honest intelligence can refuse to grant it, all the revolving years of man's experience add nothing and never can add to the eternal past, increase the magnitude, or make the sum total any larger. To such conclusions our intelligence is driven irresistibly by its own reflections. And yet this same intelligence, on hearing certain theories announced, certain technical generalities propounded,—as “Natural Selection,” “Survival of the Fittest,” “Spontaneous Generation,” “Evolution of the Universe,” &c., especially from the lips or pens of imposing reputations, behold! this same intelligence becomes suddenly dormant and quiescent, reposing all its æsthetic sensibility on the pleasing melody of a phrase or the dazzling glare of some philosophic luminary.

And now, had this incurious intelligence, long before the day of Lucretius, reflected a moment, what would it have discovered? These eminent men, in order to escape, if possible, the dreadful alternative of a personal intelligence, in voluntary supremacy, choosing his own time, superintending and controlling the evolution of worlds, have substituted a spontaneous evolution of unintelligent, inorganic matter, consequent upon certain inherent forces,—such as light, heat, gravitation, attraction, repulsion, electric and magnetic, by which the vast system of things has been gradually evolved and harmoniously arranged without the intervention of any intelligent imperator. And what all, alas! must these men have believed? On due reflection they must have seen—

1. That the cosmic development of primordial nebulae was essentially an eternal process incident to matter, in virtue of its inherent forces, and unquestionably in course of an eternal evolution, a system of universal Nature must have been generated, reached its maturity, wasted and withered away, forming the elements of another evolution, and then another, an indefinite number of times, an indefinite succession of systems of Nature, through the interminable lapse of endless duration, one of which and one only men have the late privilege of investigating. Thus, the beautiful order and harmonious arrangement of sun, and star, and planet, and system,—the profusion of animal life,—is only progressing now, once again after an indefinite succession of antecedent developments.

2. They must have believed, perhaps, that

this development commenced only some millions of years ago; and consequently matter, with all its inherent forces, had remained in a dormant, inactive state, during the vast antecedent eternity! What may have wakened up these forces from their everlasting somnolence, they fail to tell us; but, at all events, these forces, after having slept forever, suddenly wakened up. So we have never had but one system of universal Nature.

3. They must believe that at some propitious moment, in the benignant generosity of unconscious atoms, a glorious visitation of subsidiary forces, as that of life, of organization, of sensation, of consciousness, of emotion, of volition, came smiling with commiseration on these rolling worlds of insensible masses, and kindly subdued the wild regions of earth and sea! But, alas! they cannot tell us whence these new forces came; they cannot characterize them as essential to matter, as the greater part of matter is devoid of these; and still they must believe that, at some time, and some how, these new forces were superinduced upon the old.

4. The theory must force them to believe that at certain intervals huge masses of revolving flame felt a desire for something better, sent out from the solitary phlegethon subordinate colonies, disposed them at secure and proportionate distances, finally clothed them with luxuriant garniture, peopled them with material structures of all imaginable variety, filled with desires and the power of voluntary change of place.

We must believe that mere physical cohesion and chemical affinity culminated in friendship and love,—domestic affections, love of home, of neighbor, of country; that proportionate lines and angles finally evolved the true, the beautiful, the sense of right and wrong, the moral distinctions of justice and injustice! Think of it! A clod or a stone has spontaneously generated within its own structure the sentiments of love and hate, the perceptions of the true and the false, the just and the unjust! We must believe it; for it has long ago been settled that “so long as one scientific doubt remains, the story of cosmogony is still untold.”

It is needless to prolong these suggestions, which may be improved indefinitely by pens of far greater ability. The credulity which can accept these conditions, and call it a *philosophical* theory, is simply and thoroughly hopeless. Modest and moderate men, such as Plato, in forming a system of cosmogony congenial to thoughtful and rational intellects, have not merely assumed but felt the indispensable necessity of a living, supreme, intelligent Power,

who can select His own laws and His own voluntary occasion for making worlds and systems.

THE CRITERION FOR TRUTH.

BY REV. GUSTAVE REICHE.

To learn to comprehend the truth is a life-long lesson. It is about identical with the old motto, "Know Thyself." Men are generally the greatest strangers to themselves; but it requires more than half a lifetime to find this out; and, in many cases, a whole lifetime is not sufficient for it.

The longest of human lives on this earth is but short, and leaves a great many eager questions unsolved.

The lower the intellectual and moral capacity of man, the more do the very questions of his life seem to be shrouded in mysteries and impenetrable darkness. True elevation of character dispels legions of life's mysteries. But the wisest of mortals has more unanswered than answered questions before him; and, therefore, it is true that no one is too old, and no one too wise to learn. The profoundest scientific man and philosopher is but a pupil in the school of life.

These are general and self-evident truths. It is only necessary to learn them in order to perceive and acknowledge them to be truths.

But such ready assent is a mere theoretical acknowledgment, and very far from being practical. Men are always ready to assent to general and self-evident truths, even if their studiously concealed selfish lives oppose them. Such an outward or superficial acknowledgment is but the chief tribute the selfish and hypocritical life pays to truth and justice. There is a difference and certain antagonism between true theories or ideals of a good life and the actual life itself. Only the person who strives to reconcile this difference learns the lesson of true manhood.

All teachings, instructions, and self-improvements can only be made effective by classification and analyzation. Teachers know that mere generalizing would make a very unsuccessful school. They have to come down to the minutest analyzation of specific studies in order to impart some useful knowledge to their pupils.

Scientists and philosophers know this to be true, because their very studies consist in nothing but analyzation of Nature and human faculties, and of classification of principles. And in so far as they succeed in such analyzation and classification, only in so far can they arrive at the exact truth of things.

There is no lesson on the wide fields of human acquirements, intellectual or moral, that could be properly learned while classification and analyzation are avoided. Generalization is but superficiality; only analyzation arrives at the root of things. Even the pulpit will become more effective in the exact proportion in which it dives into a true analyzation of the very principles of life, and desists from unprofitable generalization and wholesale fault-finding, by which only cynical smiles are provoked.

This little reminder is in conformity with the old adage that no man and no class of men are either too old or too wise to learn. And it is certainly a pleasing thought that there are but few ministers, if any, like that certain Pharisee in the temple, that orthodox Jew, *par excellence*, who was, according to his own imagination, "not as other men are."

Only a general and constantly active psychological process of improvements is able to keep all our intellectual and moral faculties in a properly balanced order. The acquirement of useful knowledge is the first requirement for such a comprehensive process of improvement.

The acquirement of useful knowledge begins with the development of the memory in the child, and it is to be systematized and firmly established during school years. But all the young people who leave school with honors must beware of the dangerous delusion that they know all that is necessary for them to know. Any person who confirms this idea in himself steps into the limits within which repulsive folly and arrogance reign supreme.

We must also distinguish between knowledge of facts and things, and knowledge of truths. The first is a mere comprehension of facts, things, and certain orders; the second is the perception or the intellectual seeing of the proper relations that exist between these different facts and things. We find truths when we see the whys and wherefores of things, and when we see the orderly chains of causes and effects bringing order and harmony out of a seeming chaos of facts. A couple of examples will throw more light on this distinction or classification. The Ptolemaic System of astronomy will serve for one example. These ancient astronomers had before their eyes the certain facts of the movements of the planets. These facts were objects of their knowledge. But they looked upon these facts from a wrong standpoint. Believing the earth to be the center of the universe, they considered the movements of the planets to be dependent on this imaginary center. Consequently, it appeared to them that the planets moved part of the time in an easterly and part of the time in a

westerly direction, and sometimes they appeared to stand still. This, we know, was not the truth; it was a delusion resulting from their erroneous point of observation. But as soon as the law of attraction was discovered and brought in connection with the previously observed planetary motions, then this delusion was completely dispelled. All these facts, supporting and explaining each other, when seen together in their mutual relations, demonstrated the natural law of these movements, and this law is the relation existing between cause and effect. Thus the mere knowledge of facts is not identical with the knowledge of truth; but the knowledge of facts steps into a higher region, that is, into the knowledge of truth, whenever we find all the facts belonging to a certain organization working as a whole, in its orderly successions of causes and effects.

We find, also, a real staggering amount of facts collected by Mr. Darwin. But these facts do not in themselves reveal a single universal and incontrovertible truth. Everything depends on the standpoint from which they are considered. Mr. Darwin built his own theory upon these facts: this will, however, remain nothing but a mere theory, as long as certain conditions are wanting, necessary to form an unbroken foundation for the theory. And that such conditions are wanting in Mr. Darwin's theory, is his own confession.

We are, however, not only confronted in his theory by the missing links, but also by direct contradictions.

It is generally known that the main aim of his system is to prove the higher evolved from the lower, the more perfect from the more imperfect, &c. But occasionally he jumps at conclusions that would suit perfectly, if he intended to prove the opposite from what he aims to prove. For instance, he often makes use of the facts that many organisms have abortive or rudimentary teeth that never cut through the gums or nipples, and the glands secrete no milk, &c. He thinks this can be easily accounted for by supposing that they are lineal descendants of ancestors that had these organs fully developed. But this would be degeneration, the very opposite of a process of perfection. It would prove that the higher produced lower, and not that the lower produced higher species, as his system aims to prove. This reminds us vividly of the Ptolemaic system of astronomy, according to which the planets travel in opposite directions at different times. It shows arbitrariness, and not a universal law of order: it shows that the standpoint is wrong from which these facts have been observed. These examples are only given for the purpose of proving that the mere

knowledge of facts is not identical with the knowledge of truth. This now leads us to the question, What is truth? Some think it is an idle question. The following facts are pointed out to us in support of this cynicism:—

Look at scientists! What different and opposite conclusions do they draw from the same facts and natural phenomena! Each claims to be right. Look at the different philosophical schools! They do not only differ, but exclude each other as day and night. And each claims to defend truths absolutely essential to the welfare of humanity. And on the religious or theological doctrinal field, we see the same mutual contradictions and bitter antagonisms.

Indifference and intellectual inactivity find a very desirable excuse in this whirlpool of human differences, imperfections, and evils. They say, "Who can find out who is right? All seem to give reasons for their views. Truth is for every one what he considers to be such. It differs with every person: it is a personal matter, a matter of education, taste, and chance. There is no positive truth." And another adds, "It is therefore useless to trouble my brain about such matters, in which no certainty can be found. I may just as well go with the largest crowd."

But such general negations are self-contradictions: they always attempt to prove that nothing can be proved; they always endeavor to demonstrate that nothing can be demonstrated. Every one must see the self-contradictions of these ridiculous propositions to prove such general negatives.

But we see order, usefulness, and mutual support everywhere in Nature; and Truth is but the intelligible interpretation of order, usefulness, and mutual support. Order and disorder are not modifications of one and the same condition of things; but they are opposites, and exclude each other. Order, usefulness, mutual support, plan, and system, take Nature out of the wild and delirious dreams of arbitrariness and chance. And as *truth* is the intelligible interpretation of order and usefulness, therefore the distinction between truth and error is just as positive and unmistakable as the distinction between day and night.

We cannot create light, but we have an organ given us—the eye—by which we can see when the rays of light strike this optical instrument. Then we can distinguish between light and darkness. Just so it is impossible for man to create a single truth; but the capacity is given us by which we can see intellectually, when we come under the enlightening or convincing rays of it. And this analogy, or correspondence between light and truth, and darkness and error, is indestructibly incorporated in every

known language, thus proving that it is not an empty figure of speech, but the obvious interpretation of a universal law of order.

There are, as a matter of course, abnormal conditions in which the distinction between light and darkness cannot be made. The blind man is unable to make this distinction. There are also the intellectually blind, a blindness caused by senseless prejudice, resulting from ignorance and selfish and evil motives.

There must be a positive and reliable criterion for truth, because creation is not a heap of rubbish, existing in wild confusion, but it rests on order, system, and mutual support; and *truth*, we have seen, is but the intelligible interpretation of this order, system, and mutual support.

[Conclusion in next paper.]

MEDFORD, Mass., Oct. 28, 1881.

A. WILFORD HALL.

Dear Sir: I venture to take the liberty to send you the inclosed poem, which is in the line of thought with your work, which I heartily wish God speed!

Very respectfully yours,

GEO. E. DAVENPORT.

THOUGHTS ON THE DEATH OF PRESIDENT GARFIELD.

BY GEORGE E. DAVENPORT.

Death and the grave! Is there no more beyond? No more for him who late o'ertopped all men Through all the length and breadth of this vast land.

As Shasta tops his fellows,—grander far From his own rugged strength of character, Nobility of manhood, faith sublime, And will to cope with wrong unceasingly, With massive power for good to all mankind, No less to those who knew not than to those Who, wiser, saw the goal he aimed to reach, And strove with him to lift a nation up To his own height, while brawling Faction waged

Persistent war, and obstinately sought To circumvent reform, until it seemed The hydra-headed monster, many-armed, Briareus-like, would rear her gorgon-head, Triumphant, cursing all the prosperous land With her mad thirst for office—lust for spoils—Poisoning the nation's healthful arteries Till festering corruption rot the core,— Which some great sacrifice alone could stay: Then madness, suicidal and fate-driven, With murderous hand—oh, execrable deed! Accused of God and man!—struck down the chief,

And thrilled with horror all the startled land.

God worketh wondrous mysteries indeed! Oft when it seemeth darkest, light appears: Oft what itself is evil turns to good By His all-wise directing Providence, And base deeds meant by baser men to bear

Pernicious fruit, instead may bless mankind,— Though no less evil be the wrong intent, Nor less abhorrent unto God the deed. So now as lay our martyred President, Enduring suffering for the nation's sins, His holy spirit passed through all the land, And touched the mistful eyes and hearts of men. Into men's souls light streamed as ne'er before, And men saw clear as men ne'er saw before All the Divinity in man—the Good— The Brotherhood, which drew them each to each

More closely, as they came to realize All the great sacrifice, and, grieving knew Themselves not wholly guiltless of the dead: Yea, even Faction, self-condemned, crouched low

In penitence, and all the sorrowing land, Which late seemed overgrown with unbelief, Throbbled with the holy impulses of prayer; Hushed now all doubts, all whisperings of doubt:

Hushed every discord, as 'twixt hope and fear, And fervent prayers we watched in dread suspense.

But all in vain; for neither earnest prayer Nor Christian fortitude could turn aside The bitter lesson needful to make known The universal brotherhood of man.

But what of him, the brave, the great, the good, Beside whose grave all nations prostrate fall, Forgetting race, tongues, creeds, and every-thing

Save the one truth that God reigns over all.

And righteousness prevaileth in the end, Can he have passed from all existence here To live but in the memories of mankind?

Is there no life beyond for such as he?

Are men to perish like the worm that rots?—

Is *this* the end—the immortality

For which our spirits crave—to live—to die—

Remembered or forgotten by our deeds?

This is but fame—the uncertain breath of men:

And what avails it unto those who live

Unknown beyond the circle of their breath

Lives weary with self-sacrifice and toil?

Or what is it to him who lieth still

That men proclaim aloud his virtuous deeds?

He knoweth not, self-conscious now no more,

If it be true, as, boastful, some proclaim,

That what we know as death for him ends all.

How wretched is this life, and burdensome,

To those who only know its darkest side!

More wretched still with no inspiring hope

To buoy their souls with patient fortitude

To bear their burdens here, if soon, or late,

The good and ill find only this—a grave?

Believe it not! Men's deeds may live or die,

But that which gave them birth itself must be

Immortal as the Source from whence it sprang.

So when the light of some grand life goes out—

Like his for whom the whole world mourns

to-day—

The thought will come, Somewhere it shineth still,

More glorious, resplendent, purified,—

A beacon set on high to light the way

To perfect life, immortal and divine.

FRAUDULENT SCIENCE.

BY PROF. P. C. CHEEKS.

THE *New York Times* recently published an interview had with the veteran showman

Graves, in which he gives an account of how he secured the attendance of Thurlow Weed, the editor of the Albany *Evening Journal*, and a celebrated professor of anatomy, at his show of a young female orang-outang, called by him "The Wild Girl of Sumatra"; and how he, by this, received a highly eulogistic article from the pen of Mr. Weed, who a few days before refused to insert a notice of the so-called "Wild Girl of Sumatra," denouncing it as an "orang-outang, or other fraud."

"Speaking of this interview," said Mr. Graves. "I heard the Professor say. 'Why, Mr. Weed, I'm delighted to see you.' Then I saw the Professor point to the orang-outang, and heard him gush forth with, 'That is the most wonderful creature I ever saw. Charming, wonderful: my word for it, Mr. Weed.' The Professor then went into a minute examination of the animal, explaining with all the enthusiasm of an accomplished anatomist that it was one of the wonders of the earth. 'Marvelous!' said Mr. Weed, 'Marvelous!' Both Mr. Weed and the Professor shook me warmly by the hand, and they patted the little girl from Sumatra(?) on the head, and took their departure. The next day almost a column appeared in the *Evening Journal* about my girl." Mr. Graves says, "that whenever he exhibited his orang-outang he always challenged the physicians and professors of anatomy present to prove to him that he was wrong when he claimed that the orang-outang was the 'missing link' 'I would claim,' said he, 'that the formation of an orang-outang was exactly similar to the human form divine, with the exception of the caudal appendage.'"

Here is an instance, Mr. Editor, in which a cute and observing showman, with the aid of an enthusiastic Darwinian, imposed on the credulity of a distinguished journalist, and actually compelled him, in spite of his better sense, to yield to cunning on the one side and scientific idiocy on the other, so far as to pen a column of matter in eulogy of a fraud.

If faith is the offspring of superstition, then is modern evolution the offspring of ignorance! But let us see what evolutionists (theistic) themselves have to say regarding this matter.

Professor Dana (Geology, p. 603) says, "In the case of man, the abruptness of transition from preceding forms is still more extraordinary, and especially because it occurs so near to the present time. In the highest man-ape, the nearest allied of living species has a capacity of the cranium but *Thirty-four cubic inches*, while the skeleton throughout is not fitted for an erect position, and the fore limbs are essential to locomotion; but in the lowest

of existing men the capacity of the cranium is *sixty-eight cubic inches*; every bone is made and adjusted for the erect position, and the fore limbs, instead of being required in locomotion, are wholly taken from the ground, and have other and higher uses."

Thirty-four cubic inches of cranial capacity on the ape side, sixty-eight on the human, and no link between the two! Forty years given to the search! All the agony of defense of Darwinism engaged in all quarters of the earth in an attempt to fill up this fathomless and tremendous gap, and the great gulf yet remains.—"its remains of fossil man being evidence to less perfect erectness of structure than in civilized man, or to any nearer approach to the man-ape in essential characteristics. The existing man-apes belong to lines that reached up to them as their ultimatum; but, of that line which is supposed to have reached upward to man, not the first link below the lowest level of existing man has yet been found. This is the more extraordinary, in view of the fact, that, from the lowest limits in existing man, there are all possible gradations up to the highest; while below that limit there is an abrupt fall to the ape-level, in which the cubic capacity of the brain is one half less. If the links ever existed, their annihilation without trace is so extremely improbable that it may be pronounced impossible. Until some are found, science can not assert that they ever existed."—*Dana, Geology*, p. 607.

"In regard to these missing links, Darwin himself says that their absence is amazing. Even Huxley says of what is unquestionably one of the oldest fossil skeletons of man, that it has 'a fair average human skull.' The length of the bones of the arms and thigh of the man of Mentone, one of the oldest human fossils yet discovered, have the proportions ordinarily found in man, and the skull is of excellent Caucasian type."—*Cook, Biology*, p. 44.

"KIND WORDS NEVER DIE."

ELDER A. PADON, Centre, Texas, writes:—

"*The Microcosm* is a necessity. The world has been chained to materialism by science, falsely so called, till 'Wilford' unlocked the door of true science in *The Problem of Human Life*, and poured a flood of philosophical light upon questions heretofore involved in darkness. Atheistic scientists then saw that not only danger but a total route threatened them; and the satellites of the great authorities—Darwin, Huxley, Tyndall, and Haeckel—began to denounce the book; and ministers, even, as theistic evolutionists, joined the materialistic

forces, and under pretense of religious criticism helped to swell the denunciation. To meet and counteract this onslaught, a medium of reaching the public became a necessity. Hence *The Microcosm*. Had "The Problem" never appeared, we should never have had *The Microcosm*, and those intellectual treats from the pen of Munnell, and Boyle, and Patton, and Kephart, and Towne, and Stone and Balbaugh, and others. Let us thank God for "The Problem" and its outgrowth, *The Microcosm*. But for that book tens of thousands would be still supposing that science antagonizes revelation. Whilst to me the Bible was always plain on the subject of man's immortality, I was fearful to encounter materialists with their ready weapons drawn from Nature and science. I felt sure that I could not give them such demonstrations in favor of the existence of God and the substantial and immortal nature of the soul as would satisfy myself, much less them. But now I fear not to encounter the ablest champions of materialism; and since *The Problem of Human Life* has been put into circulation, I fail, in all my travels, to hear of one man who dares to undertake the public defense of that 'gospel of dirt.' Believing as I do, I am ready to work while I have strength for the circulation of both "The Problem" and *The Microcosm*, feeling that every book and every paper sent forth will do good service in the Master's cause."

Rev. B. C. Phillips, Randleman, N. C., writes: "I have been studying *The Problem of Human Life* for some two months, and many times while reading it, I have thanked God for giving us 'Wilford.' I am not a physicist, but a minister of the M. E. Church, South; and you have placed in my hands a weapon with which I believe I can demolish any scientist of the modern atheistic school, and I hereby make my grateful acknowledgements. One of the grand excellences of the book is its plainness. In it science loses all its mists and fogs, and stands out revealed as in clear sunshine. Darwinism, in all its forms, is left a huge carcass,—killed, but denied the rights of sepulture, that it may remain exposed forever to the derision and disgust of mankind."

Rev. Dr. C. S. Reeves, Greenville, Texas, writes: "I received *The Problem of Human Life*, and with profoundest interest I have read its instructive pages. After closing the last line this morning, I felt like exclaiming with old Simeon, when he had seen the Saviour, 'Now, Lord, lettest thy servant depart in peace; for mine eyes have seen thy salvation, which thou hast prepared before the face of all people.' *Sui generis!* Nothing to compare with it since the days of inspiration. How delightful!

Nay, how glorious for the Christian believer in his struggle for that rest that remaineth for the people of God, as he reads and drinks into his soul such unanswerable arguments for the existence of a personal God and a hereafter for humanity! 'Tis richer than food to the starving mendicant, or water to the parched traveler. I tell you honestly I would not take one thousand dollars in cash for this book, if I could not possess myself of another copy. My prayer is that the author may long be spared for the important work to which he has been called."

INCIPIENT INSANITY.

JOSEPH GOODRICH, in a conversation with us the other day, remarked that "the only sure way to avoid insanity in a community is to suppress the 'cranks.'" This is the key, no doubt, to one of the most important reform-movements, next to the suppression of intemperance. Men are generally almost as much responsible for becoming ungovernable lunatics as for becoming incorrigible drunkards. It is the voluntary and willful indulgence of the first or incipient drinks which leads to reckless drinking and final uncontrollable drunkenness; and it is the voluntary and willful indulgence of freaks of temper or other mental eccentricities and habits which leads to marked mental derangement and to final and incurable insanity.

At first the "crank" is indulged in his oddities by his friends and neighbors, and the impression is thus made upon his mind that if not an interesting it is at least a distinguishing and innocent eccentricity. The fact that he is regarded merely as eccentric, and tolerated in his harmless freaks, emboldens the incipient lunatic to give full rein to his peculiar bent of mentality, till his idiosyncracies change gradually to alarming features of mental aberration, which may grow ultimately into a settled condition of mind for plotting desperate deeds of assassination, or into raving maniacy which may end in unconscious murder.

Is there no way of meeting and suppressing this widespread tendency to insanity in its incipency, and thus prevent its maturing into a social evil which may and so often does result in tragedy? We cut down weeds in our gardens and fields before their seeds are matured, for an obvious reason. The social philosopher teaches the suppression of intemperance by checking the use of intoxicating drinks as a beverage, and before their indulgence has grown into an inexorable habit. So the "crank" should be treated, and his harmless

idiosyncracies regarded as a dangerous element in society, even while his odd or eccentric ways are entirely innocent, and, in fact, more amusing than baneful. What remedy can be suggested to counteract this growing danger?

Let every town, village, ward, or community, have appointed a commission of two or three of its most substantial and public-spirited citizens, whose duty it shall be to act upon all such cases of incipient lunacy that come under their observation; and let the duty be impressed upon every member of such community to watch carefully for the outcropping of "cranky" proclivities, and report them at once to this commission. Let it be the duty of the commission then to sift such reports in the same manner as grand juries inquire into alleged crimes with the view of indictment; and we believe that a private warning from such commission to any incipient lunatic would, nine times out of ten, prove his complete cure, as it would guard him in all future time from the indulgence in such eccentric food as insanity feeds on. Let any man who is thus disposed to give rein to his odd ways, or recklessly yield to bursts of anger at trifling causes, feel that there is the strong arm of a tribunal near, having full jurisdiction over his case, as well as a whole community of detectives ready to report him to his judges, and we may feel certain that such surroundings must prove a wholesome environment which will tend to curb the reckless temper of the semi-lunatic, and sober his mind to a thoughtful and considerate guard over every tendency to eccentric habit, whatever it may be. Such warning, if not heeded, should be followed by arrest and confinement till evidence of a normal mental equipose should warrant the liberty of the "crank." This summary treatment would no doubt effectually suppress insanity in any community, with the possible exception of a few rare cases which may not have developed in the manner described; and we have no doubt whatever, had this law been in force generally throughout the country, that the sable emblems of grief would not have covered this land, as so recently witnessed on account of the sad taking off of our beloved Garfield.

Though we did not start out to write on intemperance, we cannot avoid the inquiry, might not the same general plan of a commission, appointed by each community for self-preservation and self-respect, be the final solution of the problem of the suppression of drunkenness? Let the legislatures of the different States give each community the prerogative to appoint such commission for themselves, from among their own citizens, and to enforce their decisions, and let such commis-

sioners at first warn, on proper evidence, any person known to be sensibly or visibly under the influence of intoxicating drinks, and for the second offense arrest and confine for one day or longer in the county jail, and for the third offense for a longer term with fine, and so on; and we feel sure that the community which would rigidly enforce this regulation would soon see, as the result of its righteous course, the accursed practice of tippling and its legitimate fruit—drunkenness—disappear from their midst. Habitual drunkards would soon learn that the only safe way to avoid arrest and fine would be to avoid the initial drink while reason was wholly under the control of their wills. Tipplers would see that the only safe way to avoid the disgrace of a warning, at least, and surveillance afterward, would be to keep clear of "treating" and being "treated,"—till finally the rumseller, with his place of business well-nigh deserted, would learn that the surest way to make a living for himself and family would be to follow a calling that would benefit community while rendering a remunerative profit to himself. We close, then, with re-quoting the words of our friend, that "the only sure way to avoid insanity in any community is to suppress the 'cranks'"; and will add, that the only sure way to avoid drunkenness in any community is to suppress the tipplers.

DECREASE OF SOUND-INTENSITY.

On the page will be found an article from President Clark Braden on the above-named subject, with some remarks of our own appended. It will be remembered that we replied, in the October *Microcosm*, to an article in the *Christian Standard* on this subject, in which the editor of that paper called in question our former arguments against this law of sound-decrease as the square of the distance, claiming that we had misrepresented the wave-theory. Before our reply appeared, however, the *Standard* admitted its mistake, and took it all back. But the editor endeavored to correct his first article by assuming that gravitation really does decrease as the square of the distance, provided we begin at the center of the earth and adopt the proper unit of measure; and he then assumed, in accordance with the text-books, as if it were a well demonstrated principle of science, that this unit for calculating the decrease of gravity must be the half diameter or radius of the earth, namely, 4,000 miles. He next stated, all in accordance with received science, that the first unit extends from the center of the earth to its surface, and

that a body weighing one pound on the earth would necessarily weigh but one quarter of a pound 4,000 miles, or another unit, above the earth, &c. Now, we knew this to be the current view, but we are forced to pronounce it a caricature upon the very idea of *decrease* "as the square of the distance." To illustrate: The attraction of gravitation instead of *decreasing*, *actually increases throughout this first unit of 4,000 miles*, since a body at the center of the earth, instead of possessing the maximum of gravity, weighs absolutely nothing, being attracted equally in all directions by the mass of the earth's matter. Thus gravity *increases* from nothing to its maximum force in reaching the limit of the first unit, and then begins to *decrease*! The reader no doubt sees the absurdity of formulating a law of *decrease* "as the square of the distance," the first unit of which goes right the other way, increasing from nothing to maximum! What would be thought of Tyndall's carefully formulated law of decrease in sound-intensity if he had laid down the principle that from the center of sound to a radius of one foot (the first unit) its intensity *actually increases* from nothing up to maximum, and then in traveling the second foot *decreases* fourfold? This is the very kind of decrease "as the square of the distance" adopted by the *Christian Standard* and modern science as applied to the law of gravitation.

Several correspondents have misunderstood our short editorial upon this subject, on the fourth page of the November *Microcosm*. We do not there charge science with teaching that gravity decreases from the surface of the earth "as the square of the distance," using feet or any other unit as the measure. We simply said it ought so to teach if there be any consistency in the law, and we repeat it.

But we will now show this law, as applied to gravitation, to be an absurd fallacy. As proof that there is no necessary relation existing between the semi-diameter or radius of the earth and the ratio of decrease in gravitation, and to show that this assumed unit of 4,000 miles is all guesswork, suppose a globe of platinum, having the same attraction, to be substituted for the earth, what becomes of this now convenient unit of 4,000 miles? Such a globe would be about half the diameter of the earth, and consequently its first unit of measure from center to surface would be but about 2,000 instead of 4,000 miles! Would the second unit in such case change itself from 4,000 to 2,000 miles just to accommodate this idiosyncrasy of science? It is not supposable at all that the mere accident of the earth's density, in relation to its size, should have so happened in the infinite

chances of Nature as to make its half-diameter the exact unit for measuring the decrease of its gravitation. The whole assumption is absurd and impossible on its face.

But the evidence of this scientific guesswork is more manifest by reference to the magnet, which is, in its effect, a miniature earth, as its very circumscribed attraction well corresponds in many respects to the earth's gravity. But, in estimating the ratio of decrease in magnetic attraction, who ever thinks of beginning the calculation anywhere except at the surface of the magnetic pole? No account is ever taken of the size of the magnet or the semi-diameter of the mass of steel constituting it. A small magnet may have ten times the attractive force of a large one. The scientist begins his calculation of magnetic decrease "as the square of the distance" at the surface of the magnet where the attraction is at its maximum, and not in the center of the mass where it is *nil*. Should he adopt the plan of the *Standard* he would waste his time on the *increase* instead of the *decrease* of attraction to the limit of the first unit of measure at the surface of the magnet. Instead of this, he assumes some distance from the surface of the pole as the first unit, and then calculates the ratio of magnetic decrease "as the square of the distance" according to that basis, just as Prof. Tyndall assumed that sound decreases "as the square of the distance" from the surface of the sounding-fork, whatever unit of measure be employed. He knew better than to begin his calculation in the interior of the steel prong, for he would find very few air-waves there on which to base his "enfeeblement of motion."

The truth is, this assumed law of decrease is confused self-contradiction, as applied to sound, magnetism, and gravitation. Any tyro in science must see if it is applicable to sound and magnetism, without regard to size and power of the instruments; and if it be true, as science teaches, that any unit of measure will equally and correctly determine sonorous or magnetic decrease, then gravitation should come strictly under the same law, or otherwise it is no decrease "as the square of the distance" at all. Until scientists can show that a stone, weighing one pound a foot from the earth's surface where decrease commences weighs but a quarter of a pound two feet from the earth, they had better, in the language of the Rev. Prof. Boyle, "stop their noise" about this so-called law. The only true decrease or increase "*as the square of the distance*," and that which gives these words their meaning, is illustrated by the increase of the quantity of air as estimated from a central point outward; and this,

of course, is equally correct whatever unit he employed.

The true principle of estimating the ratio of decrease in sound, as stated in *The Problem of Human Life* before any one thought of calling in question this law, is this,—*that the original intensity and quality of the sound must determine approximately the unit of measure for calculating its decrease in any given case.* So also the original intensity of gravity at the surface of a planet (depending entirely upon the density of such planet) should determine the approximate unit of measure for estimating the decrease of its attractive force. Will Professor Humphreys, Prof. Noyes, Prof. Reppert, and the scientific editor of the *Christian Standard*, please note this law?

THE NATURE OF FORCE.

We do not recollect that any one has tried to analyze *force*, and definitely point out its nature and peculiarities of structure and operation. Let us look at the subject for a moment in a familiar way, and try to see if there be not some new phase of science to be discovered and brought to light in this connection.

What is this force of *gravitation*, for example, which by some mysterious connection and operation seizes an apple and pulls it toward the earth? What is this energy of *magnetism*, which, while having no tangible connection with a distant piece of iron, reaches out its invisible fingers and draws it to the poles of the magnet? Can force be mentally and rationally grasped, and then intelligibly described, so that a mind possessing ordinary education can comprehend its nature? We believe it can.

First, we must assume, as we have done in *The Problem of Human Life*, that all force is substantial, because it is impossible to conceive of the idea of an inert body *moving of itself*, or without the *actual contact of some substantial body as the cause of such motion.* Two steel magnets, for example, with their poles properly turned toward each other, though some distance apart, will draw each other with considerable force. This we call *magnetic attraction.* But these words are wholly unintelligible as they are vaguely employed in science. Reverse the poles of the two magnets, and instead of attracting they now repel each other with sensible force if held in the hand, the one pushing the other by a mysterious connection that science does not pretend to explain, and which can not be explained, as force is now understood. No man, as before remarked, can begin to conceive of these two pieces of inert

steel pushing each other apart or drawing each other together without a substantial body projecting out from the poles of each, and thus, though defying the recognition of any of our senses, producing this result. This substance must be superior to gross matter, because it will pass through sheets of glass and still produce the same effect of attracting and repelling as if no glass intervened. This is true, also, of gravitation, though not so readily perceived and recognized. No body *falls* to the earth, in a strictly scientific sense of that term. As well may we assert that a piece of iron, when it leaps from the table to the poles of a magnet held over it, *falls* to this magnet. A stone can not fall to the earth only as it is *drawn* to it by this invisible, intangible, but substantial something called *gravity.* How, then, do gravity and magnetism accomplish these results of drawing bodies and, in the case of magnetism, repelling them under suitable conditions? We will now try to make it plain, as a mental conception, for we never can see these forces however substantial they may be, nor take any cognizance of them by physical sense.

As a substance of some kind must connect the piece of iron with the magnet, even though that substance has to pass through sheets of physically impervious glass, we may, by a mental effort, see it darting out from the magnetic poles in a form resembling strangely constructed threads, and which may be imagined to curve at certain distances, and then return to the poles. In this manner the eyes of reason might see these magnetic lines constantly spinning out and returning at almost inconceivable velocity, and, as if *bearded*, grasping, on their return, bodies which are in suitable sympathetic relation, and thus drawing or attracting them to the magnet. But on changing this sympathetic relation, by reversing the polarity of the two magnets, these barbs upon the spinning threads can be imagined to reverse themselves and seize the same substances when passing outward, thus producing repulsion. In this way the mind, by aid of its reasoning powers, can see even these invisible operations of the intangible forces as plainly as with our physical eyes we watch the weaver's shuttle, and discern the movements of the threads of warp and woof as the delicate web grows before our vision. As plainly ought the rational mind to see this pushing and pulling operation of a magnet carried on by means of some substantial connection with the thing pulled or pushed, though invisible to physical sight; and we ought to see this necessary connecting link as distinctly as we can behold with our natural eyes the boatman drawing his skiff to the

shore by means of a cord attached, or pushing it out into the stream by means of a setting-pole. The man who could fancy that he saw the boatman do both of these things without cord or pole, or any other substantial connection, would be suitable material out of which to construct a modern scientist,—one who is capable of viewing magnetism and gravitation as nothing but modes of molecular motion without even substantial molecules to move! Such men would constitute boatmen extraordinary, could they, without ropes or setting-poles, haul in and shove out their boats by a mere mode of molecular motion! Possibly Mr. Keely would make just such a boatman, since he proposes to drive a train of cars and a steamship by the vibratory motion of a pint of water, in some mysterious way by means of his much-discussed, much-praised, and much-ridiculed motor. Scientists who believe all the forces of Nature to be modes of molecular motion or mere vibratory phenomena, instead of substantial things, ought to subscribe liberally for the stock of the Keely motor, for that is the very way in which the famous inventor proposes to concentrate the inertia of cohesion by disintegrating the affinities of abstract elements, and thus, in accordance with the law of correlated inequalities, superinduce a retroaction of the conglomerate molecules which he sets free by the vibratory impulse. This is as plain as science can make it.

But another phase of this discussion, as to the *modus operandi* of substantial force, here presents itself. That these assumed threads of magnetic energy, in attracting or repelling steel, take hold of the *material molecules* of the magnet, we do not assert. We incline to the belief, from strong analogies, that the substantial threads of magnetism, in drawing a piece of iron, take hold of the corresponding incorporeal magnetic substance latent in every bit of iron or other metal possessing similar magnetic properties, and that these threads draw the iron by virtue of grasping its store of latent magnetic substance. It would then be easily comprehensible that two steel magnets, with their poles repulsively presented, would repel each other by the actual contact or collision of the magnetic substance sent out from their two pairs of opposing poles. It thus seems rational to suppose that this immaterial substance really forms its contact, either when drawing or repelling, with substance of the same kind or nature, rather than with the gross material particles of the bodies thus acted upon.

In like manner, also, we ought to be able to see the substantial threads of gravity, which are inherent in all corporeal substances, dart

out from one physical body, whatever its size, and fasten upon the same threads of gravitive substance as they exist in and project from another body; and in this manner we can behold them attracting each other together, each drawing the other with a force *exactly proportioned to the quantity of the substantial force it contains*. It will be observed here, that we do not use the language of the text-books—that one body attracts another with a force proportioned to the *quantity of matter* contained in each, because this old law, to us, is manifestly not true. Hence we lay down a law which we believe to be new in physics, the reason for which will be apparent. Glass, for example, contains *more matter* than copper, for the reason that it is *less porous* than copper. The law here assumed involves the principle that the quantity of matter contained in any body of a given size must always be estimated by the absence or presence of pores or vacant spaces in the mass. Water thus contains more matter than gold, because water is less porous, though gold is twenty times heavier than water. Why is it heavier? Because, manifestly, it possesses twenty times as much of this incorporeal gravitive substance, whose invisible threads seize those reaching out from the earth, and thus draw the smaller mass to the greater. A ball of gold falls to the earth, in common parlance, with much greater force than a ball of glass of equal size, not because it contains more matter, but because it sends out more powerful threads of gravity, or a greater number of them, to seize those of a similar substance spraying out, as it were, from the preponderating earth, and extending for thousands of miles in all directions like a dense fog, had we suitable eyes to behold them. Do not reject this because it contradicts received science. That is the mission of *The Microcosm* wherever it finds science wrong, or its laws and principles unreasonable. There is no reason in saying that gold contains as much matter as glass, when it is well known to be more porous than glass. To say that it is *heavier* than glass because it is *denser*, is the same as saying it is *heavier* because it has *greater weight*. The truth is, it is heavier alone for the reason that it contains a greater amount of substantial gravity than glass, just as one magnet attracts stronger than another because it possesses more magnetic substance than another. Yet these incorporeal substances which play so essential a part in the physical universe are vaguely and unintelligibly spoken of by scientists as *force*; and when asked what they mean by “force,” they explain it in their lucid way by saying it is a “mode of molecular vibration”! Not a word do they utter in regard to its substantial

nature, and by ignoring which they can not give one intelligible reason why a ball of platinum will fall with greater force than a ball of glass of the same size. Hence the necessity of this new law, that the weight of any body depends alone upon the quantity of a certain substance which self-evidently exists in all physical bodies, and which we call gravity, but which eyes have not seen nor hands handled, though it as really and truly exists as does the corporeal molecules of the bodies themselves. By this law we explain rationally various phenomena of Nature which otherwise must forever prove a hopeless puzzle to the human mind. The beauty and application of these arguments and hypotheses here presented may not be fully apparent at the present, but their importance will no doubt become more manifest in future numbers of this journal.

HARMONY OF THE FOUR EVANGELISTS.

WE have read a most valuable book,—one that may be truly said to be indispensable to every minister of the Gospel, of whatever denomination. It is a new and very original *Harmony* of the four narratives of the sayings and doings of the Saviour, as recorded by Matthew, Mark, Luke and John. Instead of placing the different statements of these four writers in parallel columns, the author (Rev. M. N. Olmsted) has woven every word of all they say upon any one incident recorded, into a single harmonious statement, and has succeeded in making it so consistent and natural as to give a new charm and beauty to this part of the New Testament. We tested the value of this *Harmony* by reading several chapters to a skeptic, who confessed that the narrative, as thus woven together, possessed a beauty and interest equal to a novel; and this was saying a good deal for one who was an inveterate novel reader.

This blending process has taken a good deal of time, and has no doubt cost the author much labor. One thing is certain,—that the library of no Christian family, but, more especially, minister, can be complete without this work. It contains 400 pages, 12mo, cloth. Price \$1.

"ADVICE" FROM OUR SUBSCRIBERS.

In the last issue of *The Microcosm* we asked for advice in regard to our proposed project of enlarging the paper to sixteen pages, and increasing the price to all new subscribers after the sixth number is issued to \$1 a year. We are receiving many letters in response, the writers of which are about equally divided in

opinion,—many of them, who have already paid fifty cents, urging the change, and volunteering to send 50 cents more if the change is made. Others think we had better keep straight ahead as we are now going, to the end of the year, and bend all our energies to the increase of circulation, assuring us that every reader, after a year's experience with *The Microcosm*, will be prepared for the change at the commencement of a new volume, and will gladly pay the increased subscription-price for the next year. We will announce our decision in the January number, after having more fully heard from our subscribers; and in the meantime let every friend of the paper help to swell its list of subscribers at the present unreasonably low price, and let each subscriber commence with No. 1.

We take pleasure, here, in acknowledging our profound gratitude for the universal sentiment of praise our paper is receiving from those who have written us. With such kind words, coming in a hundred letters a week, who could not thank God, take courage, and work to the bent of his physical and mental powers in the interests of such a noble cause?

THAT \$1,000 CASH PRIZE AGAIN.

It is a suggestive fact that no professor of physics has shown a wish to secure the above-named prize offered by Mr. Joseph Goodrich in the September *Microcosm*, for a successful defense of the wave-theory of sound, with the exception of Professor Griffin, noticed in the last issue, from whom, however, no word has yet been received. One gentleman from Baltimore, Md., writes that he can find a competent professor who will undertake to defend the wave-theory in the columns of *The Microcosm* against the arguments of the editor, provided satisfactory arrangements can be made in regard to awarding the prize, the appointment of judges, &c. Mr. Goodrich authorizes us to assure this gentleman that he can be his own judge, and that he will be required to prove only one part of the wave-theory true, namely, its fundamental law of *interference*. That is, whenever he and his friend shall produce *silence* by sounding two unison instruments of any kind half a wave-length apart, as the theory teaches, they have only to make affidavit to the fact in due form of law, with a detailed description of the experiment for publication in *The Microcosm*, and the \$1,000 will be at once paid over. This simplified modification of the offer he extends to the professor of physical science in any college or university in this country or Europe. Now let the experiments commence. In the meantime this law

of so-called *interference* will be exhaustively discussed in the next number of *The Microcosm*.

MR. ALAN'S QUERIES.

GREENVILLE, PA., Oct. 10, 1881.

A. WILFORD HALL.

Dear Sir: Here is a quotation from "Schiller's Spectrum Analysis," p. 47, which, if true, needs investigating by some one having suitable means at hand to do so.

"Dove describes, in his own ingenious manner, the course of the vibrations as they produce successively sound, heat, and light, as follows: 'In the middle of a large darkened room let us suppose a rod set in vibration, and connected with a contrivance for continually augmenting the speed of its vibrations. I enter the room at the time the rod is vibrating four times in a second. Neither eye nor ear tells me of the presence of the rod,—only the hand which feels the strokes when brought within their reach. The vibrations become more and more rapid, till, when they reach the number of thirty-two, a deep hum strikes my ear. The tone rises continually in pitch, and passes through all the intervening grades up to the highest, the shrillest note; then all sinks again into the gravelike silence. While full of astonishment at what I have heard, I feel suddenly (by the increased velocity of the vibrating rod) an agreeable warmth, as from a fire, diffusing itself from the spot whence the sound had proceeded. Still all is dark. The vibrations increase in rapidity, and a faint-red light begins to glimmer: it gradually brightens till the rod assumes a vivid-red glow; then it turns to yellow, and changes through the whole range of colors up to violet, when all again is swallowed up in night.'"

What think you of it? Yours very truly,
W. T. ALAN.

—
ANSWER.

You are right. It is all supposition, and very baseless supposition at that. How can a rod, by the act of vibrating, be reasonably supposed to become red-hot, and after that pass to *blue* and *violet* by still vibrating faster and becoming hotter, when it will melt to a fluid state and turn into incandescent vapor before passing out of a white heat, if such thing as passing beyond that color is possible, which we do not believe? Much of so-called science is based upon just such groundless supposition as the above.

THE LAW OF INTERFERENCE.

WE have been forced, by a crowd of matter, to lay over our article on the above-named phase of the sound-theory till the next number of *The Microcosm*. We had it all prepared; but it will be better for the January number, as that issue will be sent to many professors of

physics who are not subscribers, and who, no doubt, will be specially interested in the matters discussed in that argument.

DISTINGUISHED MEN.—No. 2.



HUXLEY.

THOMAS HENRY HUXLEY was born May 4, 1825, and is now but 56 years old. His early education seems to have been quite limited, he having had but two or three years of common schooling, till he was old enough to make his way into better facilities than were afforded at the public schools of his native village. Till he was seventeen years old his educational progress had been made almost solely by his own unassisted efforts and home study, his father being a school-teacher and unable to pay his expenses at college. In 1841 he entered a medical institution, and there made the start in anatomical and physiological study and surgical observation and practice in the hospital attached to the school, which has since given him, perhaps, the reputation of the most eminent biologist and comparative anatomist in Europe.

After he had graduated with the highest honors at the University of London, in 1845, he devoted a portion of his time to attending upon the poor of that great metropolis, and thus, while doing a work of beneficence, he gained the advantage of practice in his profession, which made him an expert in the more intricate departments of anatomy and physiology, and which finally caused his selection for the post of assistant-surgeon to accompany the surveying expedition of H. M. S. "Rattlesnake" to the Southern Seas, under the command of Captain Owen Stanley, with Mr. MacGillivray as naturalist.

This vessel, like the "Beagle," made a voyage of circumnavigation, returning to England in 1850. While on this expedition Professor Hux-

ley made careful investigation into the fauna of the seas, and made several communications on the subject to the scientific journals of London, some of which were published in the "Philosophical Transactions" of the Royal Society, of which he, soon after returning, became a member, and whose name has since become one of the most distinguished upon its rolls.

In 1854 he was elected to the chair of Natural History in the Government School of Mines, a post which he still holds, and which he has honored by one of the most brilliant careers in the records of scientific research and instruction. His name is familiar to every scientific reader in both hemispheres, and has been recognized by honorary memberships in most of the scientific institutions and societies of Europe and America.

The readers of *The Microcosm* have no doubt still fresh in their minds the furore of excitement created throughout this country a few years ago by the three lectures on "Evolution," delivered in Chickering Hall, New York, by Professor Huxley. There never was, perhaps, a single course of lectures delivered in this country which was so widely noticed and commented upon by the press as this; and it is safe to say that out of the six or seven thousand papers published in the United States not a dozen can be named which did not have something to say or to quote in regard to these lectures, since for the first time by any scientist he boldly claimed to have adduced "positive evidence" of the truth of evolution. We allude to this fact only to show the prestige of the man's name, and the universal respect entertained for his character as a naturalist and an investigator of biological phenomena.

SCIENTIFIC EDUCATION.

MR. CHARLES CUTTING, of Oregon City, Oregon, sends us a communication from which we give the following paragraph. Mr. Cutting is well named, if we may judge by this incisive thrust at modern science:—

"One great reason why more discoveries are not made through men's reasoning faculties is that most men have more or less education; and to make a discovery they have first to reason away their education, and then reason out that which is to enlighten man or better his condition. The United States have a board of men—learned, no doubt—whose business it is to study the planets, to locate their positions, and find out the laws that govern them. They are located at Washington. Now I would ask for whose benefit is all this expense? They have been at work (or I might say on pay) for over fifty years; and I will give any one a leather medal who will inform me of any pro-

gress or discovery of the least benefit ever made by them. They are not accountable to any one. It is generally supposed that science and learning are an embodiment of wisdom. I am sometimes almost led to believe that science means ignorance. All men who are employed, fed, and paid by the United States, should render an account of their labors. The fact is, they have done nothing worthy of pay."

SWEDENBORG'S GRAVE.

THE remains of Emanuel Swedenborg are interred under the old Swedish church in Prince's Square, London, England. This church stands in an old-fashioned graveyard, which is furnished with irregularly placed and quaint headstones. The sexton opens the church for visitors when requested. The vault of Swedenborg lies under the chancel, and is covered with a marble slab, inscribed,—

"In the vault beneath this church are deposited the mortal remains of Emanuel Swedenborg, the Swedish philosopher and theologian. He was born in Stockholm, January 29, 1688, and died in London, March 29, 1772, in his 85th year. This tablet was erected by one of his English admirers in the year 1857,—75 years after his death."

"THE INDEPENDENT."

OUR comments upon the above-named journal in the last number of *The Microcosm* are regarded by many of our readers as none too severe, in view of the well-known proclivities of that paper. As a specimen, Prof. James F. Morton, of Leland University, New Orleans, literary editor of the *Boston Watchman*, writes,—

"Your article in the November number of *The Microcosm*, headed, '*The Independent*,' moves me to say, that I wrote the review of *The Problem of Human Life in The Watchman*; and I frankly say, that the more I consider the arguments in that book, *pro* and *con*, the more I am convinced that my judgment was not at fault in the flattering estimate there placed upon the work. *The Independent* is so habitually 'independent' of the truth, that, as you suggest, to those who are acquainted with its course it can have very little weight."

PROF. M. W. HUMPHREYS.

WE have only space for a portion of our reply to the bitter attack of Professor Humphreys, in the *Southern Presbyterian Review*. We sent the entire reply to the editor of that quarterly for publication; but out of regard, no doubt, for the feelings of the Professor, he deemed it best not to print it. We, too, claim to be merciful; but justice being one of our attributes, we will mingle mercy with justice by

printing only the closing portion of our answer. Some may think our remarks too caustic in exposition of this Professor's criticisms; but a critic who charges an author with "ignorance" in almost every paragraph of his review, and that, too, upon principles of physical science of which he himself has not attained the first correct idea, need not expect to escape without severe handling in return. Several critics, besides Prof. Humphreys, have precipitately rushed into this controversy, thinking that it would be an easy matter to overthrow our new departures on Sound, so contrary to established science, and consequently, as they naturally supposed, so preposterous in the very nature of things. But a dozen or more of these hasty aspirants for scientific fame have as suddenly gone back into privacy, with the profound sympathy of their friends as a reward for their valor. We ask that the same kindness be extended to Prof. Humphreys. The following are the closing paragraphs of our reply:—

As a fair illustration of his ability to review a work on science, or one involving in any degree the operations of the physical laws, I will now refer briefly to his attempt at answering my argument based on the stridulation of the locust, in which I claim to have shown in my book, by the clearest mathematical demonstration that this insect must exert on the mass of air permeated by its sound (four cubic miles) a mechanical force of more than 2,000,000,000 tons, if there be any truth in the current theory. Prof. Humphreys, notwithstanding his evident incapability of grasping the true relations between cause and effect in physics and mechanics, does really seem to catch a glimpse of the fact that this argument kills the wave-theory of sound unless it can be successfully answered. To pass it over in silence, as so many critics have done who have attempted to review my treatise, would have been to admit its unanswerable character, and thus to abandon the wave-theory of sound; and so, like Mr. Darwin in regard to the cause of inherited characters, he concluded that any sort of an answer would be better than none at all, and would have to be satisfactory. This answer, which he gives in unmistakable language is a fair specimen of his range of physical knowledge. He begins his criticism by saying, as usual, that my position "is based upon *total ignorance of several physical laws.*" One would think that a professor who can make such a sweeping charge against an author ought himself to know at least something of the physical laws involved in his argument, and about which he charges "*total ignorance.*" But, the truth is, as will be seen in a moment,

he does not understand the very first law of natural philosophy, which teaches that *no physical or inert body can move of itself.* He saw plainly if my calculations were correct, and if the condensed air-waves claimed to be started by the stridulation of the locust in producing its sound really depended upon that insect's physical strength for their continued motion, and for the actual condensation and disturbance of four cubic miles of air, that it rendered the wave-theory an almost infinite fallacy. He saw plainly that the movement of a locust's legs, or whatever produces its sound, could by no possibility affect the air more than a few inches around the insect; and that the idea of condensing and rarefying the four cubic miles of air permeated by its stridulating notes, thus generating heat sufficient to add "one-sixth" to their velocity, all by the physical strength of this trifling insect, would mathematically prove the wave-theory of sound too ridiculous to be laughed at. Hence he justly felt that something decisive must be done to meet and break the force of this blow, or the current theory was hopelessly shattered. What, then, could he say, except what he actually did say? I quote his exact words: "*A wave once made moves of itself, and the locust has nothing more to do with it.*" Reader, don't shake your head in doubt. Whom the gods would destroy they first make mad! My argument had evidently turned the professor's head—in fact, deranged his intellect,—or he never could have penned these ridiculous words. He plainly saw that the case had become desperate, and that the shaking of four cubic miles of air with force sufficient to bend in and out 2,000,000,000 tons of tympanic membranes 440 times a second, as required by the wave-theory, could not be attributed to the strength of an insect, or to the strength of a million horses, even, and consequently, that the only possible way to account for this rapid condensing, rarefying, heating, and cooling of the four cubic miles of air, as both the *cause* and *effect* of the locust's sound, was to assume that the insect exerted its strength in condensing only the first wave right at its little legs, and that this entire quantity of air, filled by its stridulation, actually condensed and shook "*itself*" with a force sufficient to shake a tympanic membrane, weighing half a grain, at every cubic quarter inch of this enormous mass of air. It, of course, occurred to him, as it has to many other professors of physics who have tried to answer my arguments, that a *wave of water* once started by dropping a pebble into a still pond, necessarily "*moves of itself,*"! He could not grasp the idea that the first ring of water raised by the falling pebble was immediately pulled down

by gravitation, a tremendous mechanical force standing always ready for action, and that in pulling down this ring of wave gravity necessarily presses up another ring just outside of it, but not quite so high, and so on as far as the water is disturbed. No, he was too superficial and innocent of all true scientific knowledge to see the action of gravitation in the case of water-waves; and really supposing, like a little child, that these waves *moved of themselves*, after the pebble had started the first wave, because he could not see what moved them, he carried his innocent conclusions to the action of air-waves in the propagation of sound, as taught by the current theory, and supposed the same condition of things must prevail there, and thus was led to give utterance to the most stupidly imbecile statement ever recorded by a professor of physics, namely, "that a wave once made *moves of itself*, and the locust has nothing more to do with it!"

Now, it is a fact, as a moment's reflection will assure us, that gravity cannot come into play in the case of these so-called air-waves which are supposed to constitute sound, for the very essence of the wave-theory is, as every tyro in natural philosophy understands, that these supposed sound-waves consist of *condensations* of the air-particles which act like so many elastic springs. The theory plainly teaches that the compressing of one of these air-springs causes it to impinge upon and compress the next one; this bears against the next and squeezes it together, and in this manner generates the *heat* required by the theory, and so on squeezing and compressing as far as any sound is heard. I thus try to make this matter plain, to show that gravity has nothing to do in the case of these supposed air-waves, but that, on the contrary, as every writer on sound teaches they are a succession of elastic springs bearing against each other, and that each derives its motion from the impulse communicated to it by the spring preceding it, and all from the first spring compressed. Suppose, now, a thousand spiral springs to be arranged in a row, each bearing against its fellows; and then suppose that I give the first spring in the row a push, and by the strength of my hand compress it, and that this spring bears against and compresses the next, it the next, and so on to the end of the row, is it not plain that the last spring in the row depends just as much upon my strength for its compression and motion as did the first spring touched by my hand? Is not this a self-evident fact of science? But what is the unequivocal teaching of our innocent representative of Vanderbilt University? Why, he insists that my hand moves the first spring in the row, but that the

remaining 999 springs *move of themselves*, and that my hand has nothing at all to do with them. Really one's sympathy involuntarily goes out for such a superficial ignoramus, however much one may feel like reproving his insolence. But as much as I sympathize with him I pity Vanderbilt University more, while the readers of the *Southern Presbyterian Review*, imposed upon by such a writer, are equally objects of commiseration.

But my critic is not content with this exhibition of his lack even of an elementary knowledge of physics, but he has the misfortune to frame an illustration as a confirmation of his ignorance. He says: "If an immense pair of scales had millions of tons on each arm perfectly balanced, *a locust could cause both masses to move*." Here, again, he proves that he has no conception of what moves these millions of tons, but really supposes it to be done by the locust. But why does he not stick to his improved science and contend that a beam, supporting two such immense loads, "*moves of itself*" if the weight of a locust be added to one arm? This is the way he supposes a water-wave to move after it is once started by the falling pebble! Can not some student in his confidence, at Vanderbilt University, whisper to this astute professor and tell him that it is *gravitation* that moves this enormous mass of poised matter, and that this mighty mechanical force is already pulling down on each arm of the scales with an energy equivalent to one half of these millions of tons; and that if this power has the advantage on either arm amounting to the *weight of a locust*, that arm will go down and the other will go up, provided the beam is without friction? What, then, is it that moves these millions of tons if the locust does not do it? Answer: It is *gravity*, acting with that exact equivalent of mechanical energy, plus the weight of a locust on one arm, thus maintaining inviolate the natural relation between cause and effect. What part does the weight of the locust play? Answer: It simply bears down on one arm, and thus lifts by equipoise at the other with just that amount of mechanical force, and no more, which permits gravity to put the whole mass in motion.

As this critic is such an adept in framing illustrations of which he has no accurate comprehension, let me give him one that he ought to be able to grasp. An athlete attempts to lift a ton of iron, and he succeeds, all except a *single pound*. The mass does not stir, because of his lack of the equivalent of one pound of mechanical energy. A little child, three years old, standing by, puts its hand under the mass of iron and lifts just *one pound*, and the weight is instantly raised. But Prof. Humphreys,

looking on, and true to his profound conceptions of the physical laws, declares to the bystanders that the little child *has actually lifted a ton*, and we may be sure that no scientific argument or appeal to the relations existing between cause and effect can ever convince him to the contrary! He is, of course, incapable of comprehending the fact that the child lifts *one* pound only, and that the athlete lifts 1999 pounds of this mass of iron, just as the locust on his scales moved a quarter of an ounce, while gravitation moved the rest of the "millions of tons"!

Possibly, however, on second thought, I may be wrong about the athlete and his weight. I came near losing sight of the Professor's profoundly scientific answer to my argument. According to that, he would no doubt explain that though the little child lifts only a pound, the rest of the weight "moves of itself," and the athlete "has nothing more to do with it"! Why not, since the locust condenses the air in contact with its body, but the mass of four cubic miles "*moves of itself*," and the locust has nothing more to do with it"? Seriously, it seems impossible to believe that such intensified ignorance of the first principles of physical science could find a place and be tolerated in one of the leading professorships of a great institution of learning, or that it could secure ventilation in the columns of a first-class quarterly. It seems really unaccountable, to say the least, that the directors of so prominent a university can not discover some means of impressing upon the minds of its professors this first principle and fundamental law of physical science, that no inert body—air-wave, water-wave, cannon-ball, or anything else—"moves of itself." Till that is done, parents having sons to educate, would do well seriously to consider the propriety of risking their collegiate training in Vanderbilt University.

A. WILFORD HALL.

OUR ENTERPRISE.

NEXT month (January) we intend to issue an unusually large edition of *The Microcosm* to circulate as specimen copies, in celebration of our semi-anniversary. When we commenced this paper many of our friends advised against the venture, as almost certain to end in failure. Some predicted that the paper would not live three months; while others offered to lay wagers that we would never reach 1000 subscribers. For once, the wisecracks have lost their reckoning. From the day *The Microcosm* was announced up to the present time **more than one thousand subscribers a month** have been received; and at the present time,

as we go to press, they are coming in at an average of **more than fifteen hundred names a month.**

These subscribers are among the most intelligent in the land. About 2,000 ministers, nearly equally divided among all Protestant denominations, with many Catholic priests, are regular subscribers for this paper. Also, hundreds of doctors and professors of colleges. We have reason, therefore, to congratulate ourselves and subscribers upon the success of our enterprise, which an experienced gentleman of this city, who has been connected with more than twenty different papers, declares to be without parallel in the annals of journalism. Of one thing we feel especially proud, that we have, in the first half year, more ministers of the gospel reading *The Microcosm* than ever read any other journal, whatever its age or circulation. To this portion of our readers we would here say that if we do not succeed in meeting the views of all (which is, of course, an impossibility), we promise that each number of our paper shall contain food for intellectual exercise and improvement that will at least repay the time spent in its perusal.

AN INTELLIGENT INDORSEMENT.

WE take pleasure in printing the following voluntary indorsement from the pen of President Clark Braden, author of the justly popular book, *The Problem of Problems*. The value of this indorsement consists in the fact that it is the result of careful reading by one of the ripest scholars.

NEW YORK, November 4, 1881.

A. WILFORD HALL.

Dear Sir: After a careful perusal of your work, *The Problem of Human Life, Here and Hereafter*, I have reached the following conclusions:—

I. Its refutation of the popular (so-called) scientific theory of Sound is complete and overwhelming. It is simply annihilation.

II. Its demolition of the theories of Atheistic Evolution, Development, and Darwinism, is just as complete. They are crushed beneath the load of their own admissions and self-contradictions.

III. Its position that there is an inner man—a spiritual organism in man—is scientific, correct, and Scriptural.

IV. Its position that there is spirit-substance, and that spirit-substance alone is self-existent, independent, self-sustaining, and eternal, and the cause of all derived existences and all phenomena, is scientific and correct.

V. Its position that force, or the forces in the universe, are substantial and entitative, is sci-

entific and correct. The query, "How do these forces produce phenomena?" needs further investigation and proof.

VI. It throws much light on the mysterious questions of heredity, the healing of wounds, the regrowth of amputated limbs, the retention of scars, feeling the condition of amputated limbs, and other questions that have baffled all scientific investigation.

VII. The position that there is but one substance—spirit-substance,—that matter is spirit-substance from which Spirit has withdrawn those higher characteristics of His substance that we call spiritual, and in which he has caused to appear those lower and grosser characteristics that we call material, needs clearer and fuller statement, and fuller elaboration and proof.

CLARK BRADEN.

MICROCOSMIC DEBRIS.

It is found that the effect of the electric light in conservatories is stimulating to the vitality of the plants.

In New Zealand sparrows have multiplied to such an extent that poisoned wheat is now used by the colonists to destroy them.

The small farmers in Germany cannot hold their own. Nearly 4,000 farms were offered for sale last year, and 1,000 found no purchasers.

Sir John Lubbock, the distinguished entomologist, is of the opinion that bees are, in some degree, sensitive to color, and that their favorite color is blue.

The Warsaw (N. Y.) Salt-Well Company recently struck salt at a depth of 1553 feet, in such a position as to excite the belief that the belt extends throughout Western New York.

The late Mr. Erasmus A. Darwin, whose personal estate exceeded \$750,000, has left three-sixths of it and all his real estate to his brother, Mr. Charles Robert Darwin, the eminent naturalist.

A recent religious census taken in Prussia shows that that country contains 17,645,462 Protestants, 9,205,136 Catholics, 363,790 Jews, 42,518 Dissenters, and 22,006 persons professing no religion.

The London *Daily News* announces that the original sum of £500,000 given by George Peabody, in 1862, as a fund for building lodging-houses for the poor in London, now amounts to £720,000.

Nevada, Vermont, and Maine pay less internal revenue-tax than any other three States; and Illinois, Kentucky, and New York are the three that pay most. The yield is chiefly from whisky and tobacco.

A new dye has been invented by a professor of the Technical School of Vienna, which it is said will, when applied to silks, give them a beautiful blue color by daylight, but by gaslight they appear of a rich rose color.

Franz Hilmar, the composer of the first Czech polka, the Esmeralda Polka, died at Prague recently, at the age of 79. The polka existed long before his time among the peasants of Bohemia, but he first reduced it to written musical form.

In one of the Switzerland land-slides a whole tract of wood slipped down a hillside and spread over some meadows without uprooting or even injuring the trees, thus converting at one stroke a tract of pasturage into a piece of forest land.

A recent visitor to Longfellow says that the poet is not so white from age as his portraits represent him, His hair and beard have dark lines, and his mustache has a tawny amber shade or the vanished chestnut of youth. His blue eyes are bright and his cheeks ruddy.

The latest invention reported by a Japanese journal is that of Otsuka Minakichi, who, after extensive experiments, is said to have succeeded in making rifles of silk. They are described "as rigid as iron guns, while they are easy of carriage, and have a very long range."

There is reason to believe that the Arabs have, during the past summer, found some more royal tombs in Egypt, funereal statuettes bearing the cartouches of Nectanebo II., and other Pharaohs of the last native dynasties, having recently made their appearance in the market.

Two bells, weighing two tons each, are to be fixed on the new Eddystone Lighthouse. The bells are to be rung as fog-signals. The object of having two instead of one, as usual is, that one ring may always be on the weather side of the lighthouse, from whichever quarter the wind may be.

Several years ago camels were tried for carrying freight across the California desert, but the experiment proved a failure. Some abandoned camels, however, lived and bred in the Gila and Salt River bottoms, and it is now said that considerable herds run wild in Arizona and New Mexico.

The second annual congress of German numismatists has just been held at Dresden, under the presidency of Dr. Erbstein. At the same time an exhibition was opened of coins now in use throughout the world, which is said to have been the most complete collection of the kind ever seen.

Recently published statistics of suicides in

France show for the last thirty years the extraordinary increase of 78 per cent. From 1851 to 1855 the annual average was 3,639, or one suicide for 9,833 inhabitants, while in the latest return the number is 6,496, or one suicide for 5,161 inhabitants.

The Spanish papers state that the discovery has been made in the colonial office at Madrid of a small picture in oils of Columbus, in a perfect state of preservation. It represents him as about 40 years of age, with thick dark hair and a hooked nose. It is conjectured to be a contemporary portrait.

The reports of the semi-annual conference of the Mormon Church at Salt Lake do not indicate any abatement of zeal on the part of the men with many wives. Fifteen thousand delegates were gathered from Utah, Arizona, Idaho, Wyoming, and Nevada, and their religious enthusiasm was remarkable.

Little Belgium has more of an army than is generally supposed, or than is probably good for her. In time of peace it counts 46,277 men and officers, with 10,014 horses and 204 field and siege guns; and on a war footing 103,603 men, 13,603 horses, and 240 guns. Militia reserves comprise 120,000 men.

The Channel tunnel between France and England is no longer a question of preliminary experiments. The boring has already been effected to the extent of 1800 meters from the French and 1600 meters from the English side. This makes rather more than one tenth of the entire distance to be pierced.

Among recent finds at Pompeii were several amphoræ, on some of the largest of which was written the exact date of the extraction of the wine contained within, and on smaller ones the names of the wine. Among these names two were very curious, that of "Muscatel nut" and that of "Pepper,"—of course in the Latin language.

A LEMONADE SPRING.—In one of the canons leading up to the extinct volcanoes south of Mono Lake, there is a spring of lemonade-water. At least, the fluid that oozes from the rocks has a flavor that strongly resembles lemonade. It is clear, and has such a strong acid taste that with the aid of a little sugar it could be sold for the genuine article.

No line in England carries the same number of passengers, or carries them so cheaply and pays so large a dividend, as the underground railroad of London. The number of passengers last year was 110,000,000. Several of the underground and overground railways carry workmen twelve miles a day for two cents,

thus enabling them to enjoy cheap houses and country air.

The use of the American word "caucus" is becoming common in England, and the London newspapers are puzzled over its derivation. It is said to come from "caulkers' meetings," held by Boston shipyard employeef in ante-Revolutionary times. All conferences to arrange for concerted political action were soon called "caulkers," and in time the term became "caucus."

Prof. Gulliver, of the Andover Theological Seminary, has been carefully studying the leading orthodox doctrines as they are held in New England to-day, and his conclusion is that the theology of that part of the country is as sound now as it was in the time of Jonathan Edwards. He finds no change at all in the orthodox views of the trinity, miracles, the soul's immortality, and future punishment.

Experiments by German scientists in ascertaining the peculiarities of the electric light establish the fact that it is not only healthier than other methods of illumination in leaving the air purer, but that it increases the power of the vision in some respects, especially in distinguishing colors. Red, green, blue, and yellow are made much more distinct and marked under this light than by daylight.

A son of the late Admiral Thompson Kiebo of the British navy, and grandson of the Admiral who led the forces under Nelson at the battle of Trafalgar, was recently tried in Mississippi on a charge of stealing a mule; but he was acquitted, the only evidence against him being that he was a tramp in the neighborhood where the beast was stolen. His wealthy mother sent money for his defense, and now he promises to reform.

Dr. O. Lenz, a noted German traveler and explorer, who has made long and successful expeditions into Africa, pronounces the project of flooding the desert of Sahara by cutting a canal and letting in the waters of the sea wholly impracticable, for the simple reason that Sahara is some 900 feet above the sea-level. The scheme of building a railroad through it he considers equally wild, for the reason that it could not, in a long time, be made to pay.

The uses of paper, like the developments of electricity, seem to be endless. In Berlin some of the restaurants and cafes have adopted plates made of paper for serving bread and butter, rolls, cakes, buns, and similar articles. It is probable that further use may soon be made of so safe and cheap a substitute for pottery. In the restaurants of Holland the

pretty serviettes of thin paper, which the customers may take away if they like, have been long used.

The amount of money which the Peruvian Government has received from the sale of guano is estimated at \$5,400,000,000. All it has to show for this large sum are four or five railroads, which have cost \$150,000,000. On the night the contract for the Oroya Railroad was signed, Meiggs, the contractor, is said to have presented the wife of the President of the republic with a handsome boquet, concealed in which were bills to the amount of \$500,000.

Dr. Cutter states that the increase of nervous diseases, decaying teeth, premature baldness, and general lack of muscular and bone strength greatly due to the impoverished quality of flour now in use, the gluten being thrown away in order to make the flour white. He urges the use of unbolted flour, and of eggs, milk, and butter. He denies that fish is brain-food, or that Agassiz ever said that it was and claims that butter, being nearly all fat, is a better kind of brain-food than any other.

There is a peculiar religious sect in Russia which is characterized by rare purity of doctrine and practice, endeavoring to live in the closest possible conformity with the letter of the Scriptures. No member is permitted to possess any property beyond the frugal needs of existence. Purity and chastity are among the first requirements. It sufficiently describes the brutal character of the surrounding population to say that the followers of this sect have been subjected to much suffering and persecution.

In front of Col. Thomas Mead's house, in Greenwich, Conn., stands a sycamore or ballwood tree, which is 171 years old, having been planted in 1710. It is about 151 feet high, and fifteen feet from the ground its circumference is twenty-eight feet and its diameter nine feet. A hole in the trunk, which is now no bigger than a man's hand, was not many years ago large enough for a man to crawl into, and was once used by children as a sort of playhouse. As the tree has grown of late years, the aperture has gradually closed.

A society for the promotion of experimentation in navigation of the air has been formed in Berlin. All plausible ideas and inventions in that direction are to be encouraged, aided, and thoroughly tested. A permanent station for giving aerial voyagers a good start on their flying trips is to be provided. The main object of the association will be the attainment of some practical and trustworthy method of steering balloons or other air-ships, this being

the first point to be overcome, and no progress being possible without it.

The system of underground telegraphy devised by Dr. Stephan, Postmaster-General of Germany, is now completed. On March 14, 1876, the first line of cable from Berlin to Halle was commenced, and on June 26, 1881, the system was finished by laying the cable from Cologne to Aix-la-Chapelle. In fifty-eight months eighteen lines have been laid, comprising 3,394 miles of cable. The eighteen lines connect 221 towns, including the most important places of commerce and chief fortifications of the German empire.

While removing the debris after a blast at the silver mine in Indiantown Gap, Pa., in the solid rock at a depth of seventy-nine feet below the surface was found a nest of three snakes of an apparently unknown species. They were about a foot in length, black as jet on the back, light gray on the under surface, and as a distinguishing mark each one had directly back of the head, extending around the body, a well-marked and distinct ring or collar of bright yellow. They were killed by the miners as soon as found, as they seemed vicious, and coiled to strike.

The new Chicago system of telephonic sentry-boxes for the Police Department has been adopted in Cincinnati. The boxes are connected by wires with the station-houses, and the patrolmen are required to communicate with the Captain or sergeant at brief intervals from different boxes. Thus the supervision usually performed by roundsmen becomes a matter of mechanical certainty, and there is little chance for shirking. The wires are also of great utility in sending out hurried orders, and in calling for assistance. A wagon is kept ready at each station to convey officers quickly in answer to a summons.

The ruins of the Temple of Solomon in Jerusalem are to be restored, by special order of the Sultan, without further delay. They have long been in an extremely neglected condition, and almost buried from sight beneath all manner of debris and refuse. Directions to put them into as presentable a shape as practicable were given by the late Abdul Aziz, at the time of the Austrian Emperor's visit, and the work was actually begun; but it was soon abandoned. The immediate cause of its renewal at the present time is the recent visit of the Austrian Crown Prince.

Paris has more poor than any city in the world. The number of registered poor who have received relief during the present year reaches the large number of 354,812, of whom 200,000 receive outdoor relief. The number

supported wholly by charity is over 150,000. In 1789 every tenth person was a confirmed pauper. The annual poor-rate of Paris is 104 francs per head, or \$125 per family. Paris supports 28,000 orphans and foundlings, pays the expenses of 15,000 mothers too poor to defray themselves, and has the names of 50,000 poor families on its official list.

Capt. Maxwell, a British naval officer, who has been cruising with his ship in the western Pacific, writes home that a striking peculiarity of the Ellice Islanders is the entire absence of arms among them. He did not see a club or spear, or any weapon whatever, either in the hands or houses of these natives. At Ponapi, in the Caroline Islands, he was greatly impressed with the magnitude and solidity of the residences of former chiefs, now in ruins. On one islet he found four complete squares, built one in the other, with walls, some of them thirty-five feet high and twelve inches thick.

The large sum bequeathed by the great composer Rossini for the founding of an asylum to be exclusively devoted to aged musicians in straitened circumstances, appears at length to be in a way to produce some visible result. Under the will of the popular composer and musician Musard, who died last year, a sum of 100,000 francs, destined to be applied in aid of this object, has come into the hands of the Prefect of the Seine, and it is announced that the common fund is about to be applied to the construction of the proposed asylum, for which a site is to be purchased in the environs of Paris.

One Sunday in the summer some of the men of a vessel at anchor off Columbo, Ceylon, went ashore in charge of the mate, and, while rambling in a wood, one picked up a little monkey which was playing at the foot of a tree. Its yells seemed to summon all monkeydom. Such a chorus of angry chatter arose that the mate cried, "Make for the boat," and the abductor, to make peace, dropped his prize. One monkey fell out of the phalanx to gather up its darling in a hasty embrace, but the rest rushed forward, hurling sticks and stones at the men as they pushed off. Many of the men were hurt by the missiles.

The Khedive of Egypt is reported to have set at liberty last month nearly a hundred slaves that had been brought to Cairo. Among them were some sixty girls, ranging in age from ten to fifteen years, most of whom had been sold by their own parents for sums ranging between \$100 and \$300. The greater number were black, but some who had come from Abyssinia were of lighter complexion, or even white. There were four sisters among them, who were anxious to be sold to the same mas-

ter, so that they might not be separated. It is said that the girls thus set at liberty were pretty sure to sell themselves into slavery again before long for a life in some harem.

Signor Giovanni has undertaken to restore in England the lost art of engraving on glass, called by the ancients "the art sublime." But one specimen of this wondrous art exists in England—the Portland vase at the British Museum. Signor Giovanni has produced a drinking-vessel of thick glass, out of which he has sculptured in bas relief a group representing the training of young Bacchus. Some idea may be formed of the perfection of this *chef d'œuvre*, when it is observed that the different figures, though but two inches in height, are executed with such minuteness of detail that they appear twice as big. It has been purchased for the king of Italy for \$25,000.

The cholera is spreading in the East and advancing toward Europe. It has already made considerable ravages at Aden, and has reached Medea, where the Mussulmans are imploring their Prophet. Two other epidemics attract serious attention. The first is the yellow fever in Senegal, where the number of victims has been great, and the second diphtheria, which has killed more people in the south of Russia than any other epidemic, not excepting the plague. It has prevailed there since 1872. In Bessarabia, 15,000 out of 36,000 persons who were attacked have succumbed to it. Out of 46,000 cases, 10,000 ended fatally; and in Klarkoff, out of 29,000 cases there have been 17,000 deaths.

Prof. Max Muller has announced a curious discovery of Sanscrit manuscripts recently made in Japan, by two of the Japanese pupils at Oxford. The work is the text of the celebrated "Diamond Knife," forming part of the Sacred Canon, or Bible, of the Buddhists, but hitherto known only through Thibetian and Mongolian translations, the original being supposed to be irrecoverably lost. Owing to the early practice among the Chinese Buddhists of making pilgrimages to the holy places of their worship in India, and taking back with them Sanscrit manuscripts, Prof. Muller has always been of opinion that a number of such precious relics must be existing in China. Such a discovery in Japan, however, was wholly unexpected.

HINTS TO LOVERS OF FLOWERS.—A most beautiful and easily attained show of evergreens may be had by a very simple plan, which has been found to answer remarkably well on a small scale. If geranium branches, taken from luxuriant and healthy trees, be cut as for slips and immersed in soap-water, they

will, after drooping for a few days, shed their leaves, put forth fresh ones, and continue in the finest vigor all the winter. By placing a number of bottles thus filled in a flower-basket, of with moss to conceal the bottles, a show evergreen is easily insured for the whole winter. All the different varieties of the plants being used, the various shapes and colors of the leaves blend into a beautiful effect. They require no fresh water.

Much animosity has been aroused in Canada between Christians and unbelievers, by the recent seizure of a lot of Paine's and Voltaire's works in the Toronto Custom-House. Collector Patters admits that there is no law to sustain this act, but declares that it was done in the interest of morality, and deserves the approval of all good persons. On the other hand, \$500 has been subscribed to enable the importer of the books to fight in the courts, and a general agitation on the subject of religious liberty has been commenced, while the clergy are as vigorously responding with attacks on Paine, Voltaire, Ingersoll, and Theodore Parker. Numerous converts to the churches, and greatly increased sales of anti-Christian literature, are the immediate results.

The unusual drought in Florida has had the effect of drying up Sibley Lake to such an extent as to leave only a few slush-spots here and there, and in these alligators sought refuge in large numbers, digging huge burrows into the ground. This has furnished great sport to the settlers in the neighborhood, who have gone in crowds to these spots, and fished with fine success for the enormous reptiles. The manner of catching them has been to thrust long rods with hooks at the end into one of the cavernous burrows, and stir up the occupants. One of the occupants would snap at the rod, a jerk would fasten the hook into the soft part of the lower jaw, and it would then be easy to draw the animal out and kill it with hatchets. It is not every year that such fishing can be enjoyed, even in Florida.

The Herz system of telephony has excited special attention among electricians in Europe, on account of the surprising distances through which telephonic communication has been maintained by it, and especially since the announcement that a conversation had been carried on through the cable connecting Brest and Penzance—a thing generally considered impossible, on account of the comparatively sluggish action of the electric current in submerged cables. The Herz system—by which conversation, it is stated, has been carried on through an actual distance of over 600 miles over circuits having no special adaptation to tele-

phonic communication—claims to have solved two difficult problems, namely, that of increasing the amplitude of electrical vibrations, and of neutralizing currents foreign to the telephonic circuit.

According to an English geographical writer, there are four vast areas still to be opened up or traversed by civilized man, and which, among them, constitute about one seventh of the whole area of the globe. Of these, there is the antarctic region, which in extent is about seventy-five times that of Great Britain; the second lies about the north pole; the third is in Central Africa, and the fourth in Western Australia. The south polar region referred to is almost conterminous with the antarctic circle. The vast arctic area reaches on the west very closely to the coast, and it is only near the equator that it has more than superficially been driven inland. In Australia, the great undeveloped region is that which lies west of the track explored from north to south by Stuart, and which now forms the line of telegraphic communication across that continent.

An Italian professor has just issued a ghastly volume on suicide. In all the world it seems Calabria stands lowest on the scale of those who are weary of breath. Norway stands third, and Ireland fourth. England and America are very high, and the recklessness and misery which make life insupportable reach the maximum in the center of Europe, from Geneva to Paris, and through Saxony, Baden, Prussia, and the Austro-Hungarian provinces. The small German States are the very highest. Suicide has increased everywhere for the last forty years, even in Ireland, where the figure is so low, from ten in the million to eighteen in the million of population, while England and America have mounted from 62 to 68, Prussia from 74 to 142, France from 54 to 150, and Saxony rushes on with an average of 264. Childless widowers are by far the largest number on the sorrowful list.

Charles D. McGuffey, of Chattanooga, Tenn., has been endeavoring "to get some idea" of the magnitude of the national debt at the close of the war. He has made the calculation that if four men were to sit down to pay the interest, and count a silver dollar a second, and work every second of the year, they could not keep down the interest on the original debt; and if another should sit down at two years of age to count the principal at the same rate, he would be over 107 years old by the time he counted the last dollar, interest on the principal having ceased from the first moment. The pile of silver dollars, moreover, which he would make in counting that principal would be four

feet square and fifteen times as high as Look-out Mountain (1600 feet above Chattanooga); and if the silver were conveyed in a continuous wagon-train, each wagon carrying a ton, and each wagon and team occupying thirty-five feet, the train would stretch from Chattanooga to Columbus.

A doctor in Italy has made some very agreeable medicinal researches, resulting in the discovery that vegetable perfumes exercise a positively healthful influence on the atmosphere, converting its oxygen into ozone, and thus increasing its oxidizing influences. The essences found to develop the largest quantity of ozone are those of the cherry, laurel, clover, lavender, mint, juniper, fennel, and bergamot; those that give it in smaller quantities are anise, nutmeg, and thyme. The flowers of the narcissus, mignonette, heliotrope, and lily of the valley, develop ozone in close vessels. Flowers destitute of perfume do not develop it, and those which have slight perfume develop it in small quantities. Reasoning from these facts, the professor recommends the cultivation of flowers in marshy districts, and in all places infested with animal emanations. The inhabitants of such regions should, he says, surround their houses with beds of the most odorous flowers.

There is now in the London Zoological Gardens a remarkable bird, the *Nestor notabilis*, or Mountain Kea, of New Zealand. It is a parrot of strong frame and powerful bill and claws, which were used like those of all parrots for obtaining vegetable diet, until the colonists introduced sheep and pigs. As soon as this was done the Kea seems to have abandoned vegetable food, and to have taken entirely to flesh-eating. He attacks sick or disabled sheep, and with his powerful cutting peak opens a passage through the back, and eats the intestines. Even healthy animals are sometimes assailed by the *Nestor notabilis*, and there are sheep-runs in New Zealand where considerable losses have been incurred through these strangely degenerated birds. The specimen in the Zoological Gardens gave as much trouble to capture as an eagle, tearing the clothes of the shepherd who knocked it down while pouncing on a lamb, and lacerating his hands. The Kea scorns cooked meat, biscuits, fruit, or seeds, and likes raw mutton better than any food. He will tear the skin and flesh from a sheep's head after the furious fashion of a vulture—leaving nothing but the bare skull. He at one time holds the morsels in his lifted claw, after the style of parrots, and at another grips them under his feet while rending with his beak like a hawk.

SCIENCE AND FAITH.

BY GEO. H. MCKNIGHT, D. D.

IT is very common to hear it said, at the present time, that while science is a matter of knowledge, religion is a matter of faith; and hence the inference that the former is clear and certain, and the latter vague and uncertain. Now this is not only a very superficial way of talking, but involves a pernicious fallacy which I desire in this article to expose.

First of all, let us understand what we mean by science and what we mean by religion. The words, both in Greek and Latin, from which the word *science* is derived, mean to know. Science, therefore, signifies knowledge. But in a technical sense, we generally understand by a science, knowledge arranged or formulated into some system. But all positive or certain knowledge pertains to facts: how facts exist, or forces operate, or, in the language of the schools, the *quo modo*, is a matter of opinion about which science and philosophers are often not only widely apart, but frequently in direct antagonism. Both in physics and metaphysics there are various schools of thought, and manifold are the theories held by scientists and philosophers, from Plato, Pythagoras, and Aristotle, down to Darwin, Tyndall, and Spencer.

When men speak of religion as a matter of faith, in contradistinction to knowledge or reason, in view of science, they mean Christianity, and in an objective sense; for religion, in a subjective sense, is, of course, a matter purely of personal and individual experience, and in this respect could not be contrasted with any scientific system.

But now observe, that Christianity is a religion of facts. All of its great doctrines rest upon historical facts,—as the Incarnation, the Crucifixion, the Resurrection, and the Ascension. So, too, the outpouring of the Holy Ghost, the establishment of the Church, and the conversion of the nations by the preaching of the Gospel, are facts of history, just as susceptible of proof as any other facts; and, what is more, the existence of Christianity these nineteen centuries as one of the most important factors in the civilization and progress of the race,—nay, as the mightiest moral force in the world,—is evident to all intelligent persons.

The Christian religion, therefore, is a matter of knowledge and of reason as well as of faith, just as much as any science or philosophy. Faith is not opposed to knowledge or reason; indeed, there can be no true faith without knowledge. It may not be the knowledge of

sight or of absolute demonstration, but the knowledge of testimony,—that which comes through reliable witnesses, whose witness is subjected to a discriminating judgment, a reasonable analysis. Hence to say that “where faith begins reason ends,” as did David Hume, is simply absurd. A far wiser saying or aphorism, was that of Richard Hooker, that “Faith is the higher exercise of reason.” And this is as true in science as in religion, because there are mysteries in both which the finite mind cannot grasp or solve, which lead the true philosopher as well as devout Christian to acknowledge his own ignorance and insignificance, and to adore a Being of infinite wisdom and power. The circle of absolute knowledge of the wisest, even as far as scientific *facts* are concerned, is exceedingly contracted; and when you come to causes and effects, Nature and laws, forces and operations, the scholars and *savans* are in the dark as much as the unlearned. Outside of this circle, so far as positive knowledge is concerned, all is unknowable, and hence all are agnostics. Still, theories, beliefs, or creeds are held, and have great influence upon the world, because in nearly all the transactions of life men act upon probabilities, and walk by faith and not by sight. Prof. Virchow, of the Berlin University, one of the most distinguished evolutionists in Europe, admits that faith is as necessary in science as in religion. Prof. Wm. Pierce, the author of a book on mathematics, which it has been said not more than three persons in the United States were able to understand, utters these significant words: “Faith in the supernatural is as necessary in science as to the conduct of life; and the ripest scholar is not wise if he ever leave behind him the filial spirit which cries at every stage, ‘Our Father, which art in heaven.’” Prof. Gray, of Harvard College, says: “Faith, in a just sense of the word, assumes as prominent a place in science as in religion. It is indispensable in both.” Prof. Cooke of the same College, in his admirable work entitled “Religion and Chemistry,” uses these words: “Moreover, faith is not peculiar to religion.” All our knowledge, not the result of personal observation and investigation, is held on faith, that is, on trust in other men; and absolutely all knowledge is held on trust in the authority of our own powers. Much of the knowledge that we hold without question is utterly beyond the capacity of our own intellects to verify; and moreover, no one doubts the existence of truths which now lie beyond the scope of the most gifted genius, but which hereafter may be attained by man.”

Now these admissions from such men are exceedingly weighty, and ought to put to si-

lence those small philosophers of our day, who prate so much about science as something positive and certain, and sneer at religion as simply a matter of faith,—who only boast of their knowledge because so ignorant. For men of real learning and great ability are the first to concede how little they know either of matter or spirit. “Science,” says Pascal, one of the master minds of the seventeenth century, “has two extremities to which we tend; and the pursuit of knowledge is but a course between two ignorances, as human life itself is only a wayfaring from grave to grave. The first is pure natural ignorance, in which all men find themselves at birth. The other extremity is the conclusion to which all great minds come, when, having run through all that men can know, they find that they know nothing, and meet in the same ignorance whence they set out. But it is a learned ignorance which has become conscious of itself.” A philosopher of a much later date, of great distinction, Sir William Hamilton, gives expression to almost the same thoughts, in these words: “There are two sorts of ignorance: we philosophize to escape ignorance, and the consummation of our philosophy is ignorance. We start from one, we repose in the other. If, as living creatures,

‘We are such stuff

As dreams are made of, our little life

Is rounded with a sleep.’

So, as cognizant intelligences, our dream of knowledge is a little light rounded with darkness. The highest reach of human science is, indeed, the scientific recognition of human ignorance. “*Qui nescit ignorare, ignorat seire.*”

And, asks Mr. Huxley, one of the great lights of modern science, and a leading evolutionist: “For, after all, what do we know of this terrible ‘*matter*,’ except as a name for the unknown and hypothetical cause of states of our consciousness? And what do we know of that spirit over whose threatened extension by matter a great lamentation is arising, like that which was heard at the death of Pan, except that it also is a name for unknown and hypothetical cause or condition of states of consciousness? In other words, matter and spirit are but names for the imaginary *sub-strata* of groups of phenomena.”

But now, if *savans* are so ready to confess their ignorance, what shall we say of the common people.—nay, of ordinary scholars? What do they know even of the truth of the most familiar *facts* of science, to say nothing of laws and operations? They receive all the facts of Astronomy, Chemistry, and Geology, at second-hand,—on the testimony of others,—and hence all their knowledge is most emphatically

that of faith. What, for example, do they know of the sun's distance, or that of a fixed star, from the earth? Or of the size and weight of a planet? or the velocity with which it moves? or the velocity of light or electricity? Or what do they know of the almost omnipotent powers of oxygen? or the conservation and correlation of force? or the formation of the rocks and the fossils imbedded in them, which indicate the various epochs and ages of the world, save what is told them by scientific men? Suppose I were to ask a man of ordinary intelligence, "Do you believe that the sun is ninety-five millions of miles from the earth, and that light comes from it to us in eight minutes,—hence, traveling about two hundred thousand miles in a second?" He would no doubt say, "Yes." But why? Did he ever prove it? No. Could he, if he tried? Probably not. It is a matter of faith, then, is it not? Yes. In whom? Scientific men,—men who have the mathematical ability and the time to give to such problems. And yet they have only approximated to the truth; for it is not yet positively settled what is the exact distance of the sun from the earth.

If we now turn for a moment from Nature to man himself, we shall find problems and mysteries still harder to solve. For who can tell how the body and soul are connected? or how the mind and the body, or the will and actions are related? or explain the manifold phenomena of sensation and reflection? Or who shall decide between two such philosophers as Descartes and Leibnitz?—one holding that the mind at first is a *tabula rasa* or a blank, the other to innate ideas. Then hear what Pascal says: "Man is to himself the most marvelous object in Nature, for he cannot conceive what body is, still less what is spirit; and less than all, how body can be united to spirit." There is, therefore, very little that is certain or positive in mental philosophy or psychology. We make the case still stronger, so far as natural science is concerned, when we consider the changes that have taken place, which show how unreliable, after all, are the deductions of learned men, who in the age in which they lived were regarded as almost infallible.

Take, for example, the science of Astronomy. For two thousand years the Ptolemaic system of the universe was held as true,—a system which made this earth the great center around which the sun, stars, and planets revolved.

Again in Natural Philosophy, for many centuries it was an axiom that "Nature abhors a vacuum," and this accounted for the rising of water in a pump. This error was not exploded until Torricelli, in 1608, demonstrated his theory of atmospheric pressure. In Geology there

has been no end to changes within a century. There is scarcely a geologist to-day who holds the theories put forth as science by Dr. Buckland, in the "Bridgewater Treatise," not much more than a half century ago; and there are those at the present time who regard even Hugh Miller mistaken in some of his deductions. But in nothing has there been a greater change of views than in regard to the distinction between the animal and vegetable kingdoms. A few years since these were held as entirely distinct, so far as their life and functions are concerned, but now as identical. "The fact is," says the very able Professor of Harvard College, already quoted, "that a new article has recently been added to the scientific creed—the essential oneness of the two kingdoms of organic Nature." Such facts as these ought to make men a little more modest who talk about the certainty of scientific and the uncertainty of religious knowledge. There have been no such changes as these in the Christian religion. It, indeed, like its divine Founder, is "the same yesterday, to-day, and forever." There may be erroneous interpretations of Scripture, and theological systems may be far from the truth, yet the Word of God itself is infallible,—just as there may be mistakes of scientists and philosophers, and wrong hypotheses and theories as to the real facts and laws of the natural world, yet the truths of that world are unchangeable.

In regard, then, to the teachings of both science and religion, we see that faith is necessary. True faith, however, is never antagonistic; nay more, never separated from right reason; a belief without reason is credulity, and credulity ends in fanaticism and imposture. It is quite important, however, to understand what is the province of reason in religion. It is to discriminate as to witnesses, to sift testimony, analyze evidence in regard to a revelation which it is claimed comes from God, but not to decide what that revelation shall be. Or, as Dr. Mansell says, in his very able work on the "Limitations of Human Thought": "Reason is to judge of the evidence whether the Revelation is divine, but not of its substance." When the Revelation is accepted, then the doctrines are received, though they involve mysteries far above human reason to solve." And when men say that they can not receive in religion what they do not understand, then I reply that they do receive a thousand things in science which they do not understand; and faith and reason go together here as well as in religion. I can not make my meaning clearer, or close this article better than with the following beautiful illustration of Prof. Henry Rogers:—

"We should represent Faith and Reason as twin-born: the one in form and features the image of manly beauty,—the other of feminine grace and gentleness; but to each, alas! is allotted a sad privation. While the bright eyes of reason are full of piercing and restless intelligence, his ear is closed to sound: and while Faith has an ear of exquisite delicacy, on her sightless orbs, as she lifts them toward heaven, the sunbeam plays in vain. Hand in hand the brother and sister, in all mutual love, pursue their way through a world on which, like ours, day breaks and night falls alternately,—by day the eyes of Reason are the guide to Faith, and by night the ear of Faith is the guide to Reason. As is the wont of those who labor under these privations respectively, Reason is apt to be eager, impetuous, impatient of that instruction which his infirmity will not permit him readily to apprehend,—while faith—gentle, docile—is ever willing to listen to the voice by which alone truth and wisdom can effectually reach her."

PHYSICAL, INTELLECTUAL, AND SPIRITUAL LIFE.

BY PROF. I. L. KEPHART, A.M.

PHYSICAL life is that unknown something which permeates and gives motion and growth to organized bodies. It is common to animals and plants. The most advanced biologists tell us that this life has its basis in protoplasm,—that the protoplasm of an animal or a plant contains all the life there is in that animal or plant. As yet, they have failed to determine exactly what protoplasm is; but all agree that the protoplasm of an animal and the protoplasm of a vegetable, in all their physical constituents, are precisely the same,—that the most powerful microscope fails to reveal any elemental difference,—and that it is "a glairy, tenacious liquid, with a consistency somewhat like that of an unboiled egg." Protoplasm is discernible only by the aid of the microscope. The white corpuscles of the blood are composed of masses of it. It is of immense interest to the biologist, because it constitutes the last hiding-corner into which he chases that mysterious something called the life-force. Here, in this little cell of protoplasm, physical life secretes itself, and before its impenetrable portal the eager investigator stands, vainly asking, "What is it?" "Where is it?" "How is it?"

This mysterious "force" astonishes the student of Nature, not so much by eluding his grasp as by its wonderful operations. For example: it will take two particles of protoplasm, that, so far as he can discover, are precisely the same in every particular, and from the one it will develop only a jelly-fish, and from the other a *man*! Why such vastly different results from (so far as he can see and know) pre-

cisely the same beginnings, is, to the biologist, the great problem of problems. Whether or no he will ever be able to solve this problem scientifically, remains to be seen. Thus far scientific investigation has established the fact that physical life has its basis in protoplasm; but what that life is, and where, how, or why it has its beginning, is a profound scientific mystery.

But, if we turn to intellectual life—to thought—the mystery of its existence is as much greater than the mystery of physical life, as thought is superior to vegetable growth! No physical investigations have enabled the student of Nature to make the slightest approach to that grandest of all physical mysteries, namely, the enduing of physical organisms with consciousness,—with the power of reason,—with the ability to *think*! By the aid of the microscope, he traces the "life-force", down to its hiding-place in the cell of protoplasm,—a substance which is utterly beyond the chemist's power to produce,—and there, for the present, he must stop. But when he turns to thought,—to intellectual life,—he can not do even this much. Without the life-force, the protoplasmic cell can not be developed into an organized body; but it can not be said that *thought-power*, or intellectual life, is developed from protoplasm, or any other material substance, or is in any way dependent upon such substance for existence. That it is dependent upon material organisms for the ability to manifest the fact of its existence to the perceptions of minds encased in material organizations, is a fact concerning which there is no dispute; but that it is capable of existing independent of matter, *and often does so exist*, is quite presumable from its very nature: and all the observations made upon the material structures which it inhabits fail to reveal any facts upon which to base a presumption to the contrary.

If the mysteries connected with physical and intellectual life are so great,—so incomprehensible to the scientific investigator,—why should the mystery connected with spiritual life—the reunion of the soul with God through faith—be set forth as a sufficient reason for disbelieving that there is such a thing? If mystery is a valid ground for unbelief, how can any one believe that he even *lives* and *thinks*? How we live, and how we think, is to the materialistic philosopher, and even to the true scientist, as much an unsolved mystery as is the soul's taking hold of God through faith, and being lifted into a new life in Christ Jesus. All are facts—*mysterious, well-authenticated facts*! But why should the former be admitted, and the latter ignored?

There is no telling to what extent the mys-

teries of life may yet be solved. Candid, persistent investigation, may do much in the way of lifting the veil that exists between the seen and the unseen. We are told that after the fall, a flaming sword was placed between man and the tree of life, "lest he should reach forth his hand, and eat of the fruit, and live forever." It was not desirable that, in his fallen state, alienated from his God, with all the higher faculties of soul and intellect dwarfed and shriveled, he should live forever. A process of moral development, of schooling, of *redemption*, is necessary to fit him for everlasting life. May it not be that, through the reformatory agency of the gospel, man will go on investigating and increasing his fund of information,—rising higher and higher in the scale of exalted being,—until by actual scientific research, he shall possess himself of the secrets of physical, intellectual, and spiritual life; and thus, by a long process of research and moral improvement, running through hundreds of generations, at last place himself where he may *literally* put forth his hand and take of the tree of life and live forever? May not the angel with the flaming sword be removed by man's devoting himself to intellectual and moral improvement? If the first pair, in the exercise of their freedom, had eaten of this tree, instead of listening to the seducements of Satan, would not man have lived forever in his primitive innocence and blessedness? Who will dare to say that *true* science will not finally lead man back to his God and eternal life? Just in proportion as its apostles push their investigations, thereby exploding false theories of science, and false dogmas of theology (and there are plenty of both these to be exploded) do they hasten the day when *the truth* shall liberate the world.

PRAYER AND NATURAL LAWS.

BY DR. C. H. BALSEAUGH.

THE Bible knows nothing of severing Nature from God, even in her minutest operations. He is everywhere or nowhere. The falling sparrow, the dying midge, the rounding dew-drop, the headlong tornado, share His superintendence. Atheistic scientists are right in their insistence that if impersonal law rules an atom, they have demonstrated the origin and permanence of the universe without a self-existent, eternal, all-directing Personal Intelligence. But the atom has always baffled them, and always will. They can never get done with it. Their deepest wisdom and most searching experiments have always left something unmastered, unreached, unapprehended, in every particle of matter to which they ever

applied their tests. When they are able to get to the bottom of their bread and butter, it is time enough to proclaim the non-existence of Deity. Tyndall and his compeers can no more tell us what is the primary fact of the butter they eat, or the coffee they drink, than the baby in the cradle. There is no greater inconsistency in praying than in eating. Tyndall and Huxley, and even the wild, daring Haeckel, and the bold, blasphemous Ingersoll, pray, without knowing it, every time they eat. They deal with the same mystery in all they do and handle, and that which evokes the Christian's prayer. There is as much room for the petition, "Give us this day our daily bread," as for the scientist's confession of a something that transcends the highest stretch of human wisdom. That something stares the scientist in the face everywhere with all the attributes which the Bible ascribes to God. The fact of the Divine Omnipresence, and the compatibility of prayer with natural law, is nowhere more emphatically and comprehensively stated than in these words: "Give us this day our daily bread." Where does law reign more supremely than in the wide circle to which this petition refers? And yet prayer relates to every item in the vast category. Either Tyndall is a blockhead, or Christ is an impostor. The Author of Nature should know how prayer dovetails into the laws of the universe. He should be as wise and competent to reason as Tyndall. When this great, reckless, learned, ignorant scientist, wishes to produce new results by the voluntary correlation of eternal laws, he is not hindered or troubled by the consideration of the stability of Nature. But when the Christian prays a greater than Tyndall to do the very same thing, whether on a larger or smaller scale, he is pronounced a simpleton. There is not a sillier, more inconsistent, class of men on God's earth than the God-disowning scientists. In the same breath, and with the same penful of ink, they are constrained to tell the world that at every step in their investigations of matter, they find the justification of the Christian's faith. The day is here in which the boasters and blasphemers are strengthening the testimony and enriching the literature of the Church of the living God.

IDENTITY OF THE HUMAN RACE.

BY REV. A. W. LIGHTBOURN.

THE distinct individual unity of the human race is a grand fact which has never yet been successfully disproved.

Though sundered by climate, language, and various external conditions, there is still one

deep, underlying identity, which makes the universe a neighborhood.

This is an instructive and important subject, worthy the attention and serious consideration of all to whom it is addressed. It is by no means new or novel. It is as ancient as the creation of the first human pair. It is interesting, because it bears upon the present prospects and future fate of all human and accountable beings. It is deeply interwoven and essentially connected with the whole of divine revelation.

All the doctrines and duties taught in the Bible are harmonious. They are all closely connected with each other, and are necessary to form a complete system, that man may be instructed in all those things which may exalt the dignity and fulfill the destiny of his being. No general truth can be taken away without breaking the great chain of revelation.

In this word we are taught the *Identity of the Human Race*. "And hath made of one blood all nations of men, for to dwell on all the face of the earth." This expression teaches us that all human beings upon the globe have the *same kind of animal life*. But our present desire and design is to reconcile, by natural and moral causes, those varieties of figure, feature, and complexion, which exist among the human species.

I would observe, in the first place, that Esquimaux, the Samoiedes, and the northern tribes of the Tartars, have their head and breast uncommonly large, the neck uncommonly short, the hands and feet uncommonly small. The *cause* is the *climate*. They live in the northern parts of the globe, in which regions intense and almost perpetual cold reigns.

The natural effect of a climate so cold is to restrain the growth and expansion of limbs most remote from the center of warmth and circulating heat in the body.

The natural consequence is, the size of the hands and feet are greatly diminished; whilst the head and breast, which receive the most forcible impulse of the blood, will be proportionably enlarged. And as the head and breast are so greatly expanded, the neck is apparently shortened.

Should any of us be removed to those regions of the north, we should readily contract their habits; and, by assimilation, partake of all their peculiarities in a few generations. For illustration, suppose a tree, in a warm climate, to have a long and slender body, and very extended limbs. Let a young shoot of the same be transplanted to a cold climate, and reproduced for a few years, the body of the tree

would become much shorter and thicker, and its branches not so extensively spread.

In consequence of the unremitted constriction of cold, a particular habit of body, disposition of mind, and configuration of features, become more or less strongly marked, as the cause is found to operate.

Consider for a moment the peculiarities of the Jews. They are dispersed through every country of the world, and they have four differences of complexion,—the fair, swarthy, olive, and black. In whatever region they are found, they are marked with the common complexion of the natives.

The Jews who live in Great Britain and Germany, and who are the descendants of past generations, have an intermixture of a fair and ruddy complexion, resembling that of the English and Germans. Those of Spain and Portugal are swarthy, as are the Spaniards and Portuguese. In Syria, they, like the Syrians, are of an olive color. But in India they are black.

Now, to what shall we ascribe these very different shades of complexion, if not to the varieties of climate, manner of living, and other concomitant circumstances?

They are known to be descendants of *one* family, and to have but very few intermarriages with other nations. With many temptations to coalesce, amid temporal motives, and the desire for revenge, persuading them to amalgamate, yet through all they have maintained their separation. They are still faithful to the peculiarities of their fathers, even in their altered fortunes, national shame, and world-wide reproach.

We will consider next the inhabitants of Africa. They are an inferior race, compared with our own highly favored people, and scarcely worthy to be ranked among human beings. But what these degraded creatures might be in a few centuries, were they to possess our situations of climate, society, and mental improvement, is illustrated by the improved condition of those already among us. Their silly and idiotic countenance, sullen and dejected looks, and coarsely wrinkled visages, present a picture of the effects of a fervid sun upon the head and body.

We know also that poverty of diet, degrading ignorance, and filthiness in manner of living, tend greatly to debase the corporeal system, and debilitate the mind.

A peculiarity of the Africans, which deserves to be noticed, is their hair resembling wool. Universal experience demonstrates that climate has a powerful effect upon the hair, fur, or wool, of all animals, to render it coarse or fine, sparse or thick, according to the tempera-

ture of the region in which they are found. Neither is this the child of chance, but the care and design of God.

The curl and color of the hair depend upon a certain excrecence of that secretion in the skin from which it derives its nutriment. Also, the evaporation of a volatile gas, rendering the surface quickly dry, and disposed to contract, while the center continues distended, necessarily producing an involution or curling of the hair. The *color of the hair of the tribes of the torrid zone is black universally.*

Another peculiarity of the Africans, is their black complexion.

It should be kept in mind that the color of the inhabitants of the torrid zone is generally black,—modified, however, by various circumstances, such as the elevation of mountains, the vicinity of seas, and being open to wholesome or to scorching winds. As we advance toward the equator, we discern successively the various grades of dark complexion, from the swarthy to the blackest hue of the human skin. Independent, however, of the discoloration produced by the direct rays of the sun, the effect of constant heat is very powerful on the action of the liver, the great laboratory of bile in the human system. And as this bile is increased in quantity, the black hue of the skin is heightened.

Coarse living, unpolished society, and severity of climate, are reasons sufficient to account for all the peculiarities and irregularities of complexion, features, and stature, which characterize the inhabitants of these rigorous regions.

Some Europeans and Americans have their residence in the northern temperate zone, where climate is favorable to a fair complexion. With us the cultivation of the arts and sciences is carried to its greatest perfection. And where a people have long cultivated refined manners, a general aptitude becomes hereditary.

Thus this influence and these effects will be communicated from posterity to posterity. Birth, education, salubrious climate, and manner of living, give the superiority of some nations over others for stature, features, and complexion.

This subject calls loudly upon us for the exercise of gratitude and charity. We may well exclaim, in view both of climate and every endearing privilege, "Our lines have fallen to us in pleasant places, and we have a goodly heritage."

Then our gratitude should prompt our charity. Haggard strangers are peering through the sea-fret of life; and as they approach us through the parting mists, we find

that they are brethren,—heirs with us of the same glorious prospects that gild the future.

WITHOUT BEGINNING.

BY REV. T. WILLISTON.

Is there anything without beginning? If there is, what is it?

1. If nothing has ever existed without *beginning* to exist, how could anything, material or immaterial, be in existence now? Were all existing things annihilated and a total vacuum produced, how could anything be reproduced? Can Nothing ever give birth to Something? If, then, there ever was a time when there existed neither mind nor matter, nought but a perfect vacuum would now exist. And since something does now exist, it follows that *something* has *always* existed; and whatever has always existed has, of course, had no beginning.

2. What *must* be true of anything that has had no beginning,—anything that has eternally existed? What properties must it of necessity have? (1) Absolute and eternal independence. Having eternally existed, it of course derived its being from no antecedent being or cause, and was dependent on nothing but itself and its own power. And being totally independent for its existence, it must forever remain independent. Nothing can ever render that dependent which has once been absolutely independent. (2) Omnipotence. One can not conceive of any mightier power than the power to exist without beginning, without borrowing leave of any antecedent cause. Reflection will convince a logical thinker that whatever exists or can exist from eternity must necessarily be almighty, and wholly and forever independent.

3. We will now inquire *what* is that something that has had no beginning. All existing things can be resolved into these two—*matter* and *mind*. Have both these had no beginning, or only one? If but one, which? If *matter* had *always* existed, could it ever have become that inert, soulless, dependent, and comparatively weak thing that it is? Would it have consented to be controlled by us as largely as it is? Ah, matter is far from being independent or omnipotent; and yet such it would of necessity be if it were eternal. Matter, then, must have had a beginning. And if chaotic, unorganized matter can not be eternal, neither can it be true (as a few anciently believed) that the world as we now see it has had no beginning, and that there has been an eternal succession of plants and animals and men. As well might we say that a pendant chain, each link of which is sustained by the one next above it,

can be extended upward interminably without ever having a staple overhead to hang on.

Now if the argument thus far is impregnable, the conclusion is irresistible that *mind*, or that incorporeal thing which thinks and reasons, is the thing, and the only thing, that has had no beginning. And since that which has had no beginning is of necessity independent and all-powerful, we reach the conclusion that all existing things owe their origin to a *Mind that is almighty and absolutely independent*: in other words, to the very God of the Bible!

We see that reason and logic conduct us to the same conclusion that the Bible does. But suppose our reasoning was unsound, what cosmogony shall we adopt? Shall we fall back on the theory that all things got their present form and arrangement through the accidental collision and adhesion of numberless uncreated atoms that had from eternity moved at random through the voids of space? Or if this theory, once advocated, will hardly do for modern thinkers, shall we yield assent to the idea that all existing things, whether corporeal or incorporeal, have, in the progress of ages been evolved out of some minute material germ? Ah, if matter be the father of mind and the originator of this stupendous fabric, how have we sinned in that we have withheld the homage that is matter's due!

It is surprising that, until recently, some Christian scientists have, like Plato of old, believed that God and matter were eternal. If true, as Plato believed, that matter was just as old as God, then his inference from that fact was a sound one, namely, that matter has power to resist and frustrate God's will to some extent. Had he followed out his theory to its final and legitimate conclusion, he would have seen that matter was totally independent of God, completely above and beyond all control, human or divine. If God and matter are co-eternal, we in reality have two Gods, totally independent of each other, and the God of the Bible is not the sole sovereign of the universe. What Jehovah did not precede and did not originate, it is logically certain that He can never control.

THE CRITERION FOR TRUTH.

BY REV. GUSTAVE REICHE.

[Concluded from last month.]

EXPERIENCE has taught us that there is not such a thing in existence as an isolated truth.

Truths are organizations of different degrees and orders,—as, for instance, natural truths, civil truths, and moral truths, relating to the world of matter; and spiritual truths, relating

to the world above matter. Each class is an organization in itself; but these different organizations are again dependent on each other, —as the mineral, the vegetable, and the animal kingdoms, in Nature.

Each truth is therefore found to belong to a certain orderly succession of facts, all dependent upon and supporting each other. This is easily illustrated by again referring to the science of astronomy.

Copernicus asserted, against the Ptolemaic system, that the earth is not the center around which the planets revolve, but that the sun is this center. But this was, at first, a mere assertion, because many arguments used by Copernicus were just as vague as the arguments used in support of the Ptolemaic system. The great truth that the sun is the center of our solar system, and the planets with their moons the circumference, has been a growing revelation in clearness and certainty. The first great fact that shed a flood of light upon this great truth was the discovery of the law of attraction. From this grew the certain knowledge of the law of centrifugal and centripetal forces. The mathematical truth that the center must be first, because the circumference results from it, made this great truth still more certain. We see that the earth is constantly dependent on the sun's heat and light, which proves that the sun, as the earth's cause and center, must have been first. And the spectral analysis gives additional strength to these previously discovered truths. It shows that all matter composing this earth exists in its elements, and in a molten condition, in the sun. This proves still stronger the sun to be the cause and center of our solar system, and re-affirms and harmonizes all the previous truths, demonstrating together the orderly movements of the planets, and the universal order consisting in innumerable families of solar systems. Nor are these truths contradicted by the fact that cold increases the farther we advance above the earth and toward the sun. It has been demonstrated that the temperature is not determined by the distance between the sun and the earth, but by the attitude in which the earth stands to the sun, and by the condition of the earth's atmosphere.

These examples are given for the purpose of proving that truths do not stand isolated, but that they are organizations, the different parts of which support each other and point out the regular successions of causes and effects. This proves, at the same time, that any element opposing or jarring in a certain organization of truths must be in error.

The first important element of the criterion for truth is, therefore, the principle of non-

contradiction. Every principle, then, that does not contradict itself, nor any other well-established truth, but which strengthens all well-established truths, and harmonizes with them must be truth. And by well-established truths we must not understand mere opinions or theories based on traditions, usages, or by authority, but we must understand principles established by generally accepted rules of logic,—things that speak in axioms.

The other important feature of the criterion for truth is the question of usefulness.

Usefulness must not be viewed or contemplated from the standpoint of grasping selfishness. Proper usefulness does not make self-gratification the sole and main object of life; but it aims principally at the most general and effective elevation of character and manhood. Such an aim deserves the designation of neighborly love or practical goodness. And this only is to be understood whenever goodness or usefulness is again mentioned in this discourse.

Truth and goodness, or practical use, are related to each other as light and heat. Vegetation needs heat and light combined. Light without heat does not produce anything. So is truth useless without any affection for good. The most useful and sacred truths in the keeping of selfish persons are only used for self-inflicting purposes; and this always creates a spirit of antagonism and detestable wrangling. Truth thus used for what it is not given is filled with corruption and animated by the essence of error. Every hypocrite is a living example thereof.

On the other hand, heat without light produces a very sickly vegetation, without duration and without use. So do well-meant affections, without the properly directing truth, produce but unpalatable, sickening, and spurious fruits of goodness. It is therefore evident that every genuine truth is related to some goodness to which it endeavors to lead. So is every error related to some evil of life, which it supports, and to which it endeavors to lead.

The criterion is, therefore, *the principle of non-contradiction, combined with the test of goodness, illustrated by usefulness.*

No real truth is a mere theory.

Whatever has no good and practical result in view is useless, and is not truth. We are better off without such useless rubbish than with it.

This now proves, finally, that truths cannot be fully established by mere rules of logic. So we say correctly, from an analytical point of view; but from a higher—from the synthetical—standpoint, we see that all correct rules of logic are based upon facts of order and harmony, resting ultimately on practical good-

ness, as heretofore defined. Logic would have no existence without such a foundation. This truth is supported by the following facts:—

No great leading and ennobling truth is known to us that has not been established by lives of usefulness and self-denial. Every ennobling truth is a most sacred legacy of men who did not make mere lucre the sole aim of their lives, but whose examples of nobility and generosity kindled the noblest and purest emotions of which the human heart is capable.

Men left us such sacred legacies, who unfolded the highest types of manhood, who could not be corrupted by threats, sufferings, or flattering promises. Without such lives the highest and most conclusive criterion for truth would be missing; yea, without them we would be justified in saying that there is no positive truth.

No fortune-hunter has left us such a legacy. Persons who have only cringing smiles for all who are more powerful than themselves left us no such legacy. And no one who considers others only fit to be his tools will ever leave us such a legacy. Such are only warning examples in the world, as far as genuine truth and justice are concerned.

Therefore, the truth can only be comprehended by those who seek it, not for selfish purposes, but for the purpose of practising the goodness it depicts, and assists in appropriating it. And this is the reason that every person's quality and aim of life is responsible for his belief. But the time is too short to prove this more extendedly.

No human authority can lead us out and above all conflicting and short-sighted ideas, and into the clear and serene daylight of truth. There are some persons who think that it would be very good if we could suppress some dangerous ideas and doctrines by force of law. But all those thought so who persecuted, tortured, and murdered others in a most cruel and blood-curdling manner, on the fanatical charge of heresy, and who proclaimed that they were thus performing works exceedingly pleasing to the Almighty. What ridiculous contradictions of professions and facts would this be, if they were not so thoroughly fiendish! Mere power does not convince or improve. This can be strikingly illustrated by a little anecdote.

Old Frederick the Great, of Prussia, overheard once a little street boy indulging in epithets not very flattering to his majesty. This enraged the old man. He took the little fellow by the collar, and gave him a severe thrashing with his cane. And with every blow he struck he cried out, "Thou imp, thou shalt love me! Thou imp, thou shalt love me!"

Of course, the boy ceased calling the old king names, at least as long as he was within hearing of him; but whether he loved him any more, that is quite another question. Power can only crush, but not convince: it can make slaves, but is utterly impotent to inspire any love for truth and goodness.

Neither genuine truth nor love comes with crushing power. The Divine Author of our religion demonstrated this by word and act. And where the convincing—not compelling—power inherent in truth and goodness, can not incline a person's will to love and learn them practically, such a person is intellectually and morally incurable. But the determination to appropriate these elements of the divine likeness and image does not shun the necessary and confirming test.

Joseph would never have been the lofty example of chastity had he not conquered the enticement to the opposite vice. Virtue before the test is a mere imagination. So is truth before the test, an impotent and vacillating shadow of a principle.

THESIS.

A truth asserted before us is really no truth for us,—as far as our experiences are concerned. It is a mere thesis,—a principle yet to be maintained by passing successfully the ordeal of its negation, or the

ANTITHESIS.

The negation will call the power inherent in every truth into full activity, and unfold its unmistakable connection and relationship with other well-established truths. Thus it is elevated by the antithesis to the synthesis, that is, we see it there standing as an incorporate member of a whole body of truths.

Whatever can not maintain itself on this unavoidable road from the thesis, through the antithesis, to the synthesis, is not worth keeping and not worth mourning for, because it is no truth, no matter how much it may have been puffed up as such. And whatever avoids this ordeal or touchstone is a miserable and cowardly pretense.

The real test for truth, then, can not be found in any tradition which has no other support but age; nor can it be found in any human authority and all kindred and mere brutal forces. And all the conflicting sects and isms on the scientific, philosophic, and religious fields, are but so many shadows of human imperfections, errors, and evils, thrown upon the clear daylight of eternal truth.

The eternal fitness of things, which admits of no contradictions, and which reveals and portrays the highest ideals of nobility of character is the unerring criterion of truth.

These ideals stand above us, and the best of mortals are only endeavoring to approach them. The higher and better the condition of society, the higher will these ideals ascend. And, standing always above the highest moral and intellectual acquirements of the human family, and being the only possibilities for all human progress, they will always point from the finite to the Infinite.

And teachers of public and private schools and institutions of learning, being justly and wisely prohibited from teaching religion in accordance with any sectarian views and doctrines, should comprehend the truth, and teach it in the given relationship to nobility of character, goodness, and general usefulness. This will kindle and strengthen the very spirit that leads to the purest religion, unadulterated by human passions and disputes. This is superior to the dangerous inculcation of a wild craving for vain glories and startling notorieties, which has aided in a great many moral shipwrecks.

ORGANIC DUALITY.

[From *The Age of Progress*, Fairview, N. J.]

THE scientific view now becoming somewhat prominent that in all living forms there is an invisible counterpart within, which is the life or soul, in which the mind or instinct dwells, and which is the medium through which all impressions made through the external senses are conveyed to the consciousness, is certainly a most interesting conception, if not already a demonstrated fact. On this hypothesis many things are rendered clear which are otherwise inexplicable,—such as the complete development or regrowth of a supernumerary finger on a child's hand after it had been cut off to get rid of the deformity (see *Problem of Human Life*, p. 460). Cases are reported of their growing again, by the gradual putting out of new fiber according to the pattern of the substantial but invisible child within. On this hypothesis we have a clear idea of the soul of man, which, although invisible, must still be *substantial* and indestructible, and therefore must be immortal. But this inner invisible counterpart of every living form belongs to the beasts of the field as well as to man. Their souls are also indestructible; are they also immortal? The Christian scientist says, "No: their spirits go *downward*, whilst the spirit of man goes *upward*." The substance of their souls and instincts is swallowed up by the Infinite, as a drop of water returns to the sea. Why not, then, the souls and intellects of men? The only certain answer is, Revelation teaches us that God breathed into man the breath of immortality; but not so into the animal creation.

To them He only gave during their physical being the internal organism of life and instinct, to be reabsorbed into His own life and spirit, as their material parts return again to earth. But to man He gave what He alone hath—immortality. Man's soul and spirit—a substantial organism, the exact counterpart of the material, though invisible to our physical eyes, imponderable and intangible,—is nevertheless indestructible and immortal, because it pleased the Infinite so to create him. The time is coming when the earth will not take back man's material body, as it did not take back Christ's material body; for the last enemy to be conquered is physical death. Men living in the flesh are to be changed into spiritual bodies without death, as were Enoch and Elijah. Science is beginning to catch up with the Bible.

Every new subscriber should take the back numbers of this paper from the commencement of the volume. They contain consecutive articles of too much value to be missed. Many of our readers have declared the two articles on "The Immortality of the Soul" (August and November) worth double the price of a year's subscription.

“THE EVANGELIST” (Chicago).

A REVIEW of *The Problem of Human Life* appeared recently in the above-named paper, which needs a passing remark. *The Evangelist* does not object to the arguments of the book as a defense of religion against the philosophical claims of materialism, but the writer confines his criticisms solely to the author's position, that it is impossible for *something* to be made out of *nothing*. We frankly confess that his arguments, so far from converting us, have but confirmed our belief in the absolute impossibility of such an act of creation, even by a God of omnipotent power. At first glimpse this would seem to limit infinity; but it is only so in appearance. Let us begin with correct definitions. We regard omnipotence as signifying the ability to do whatever is possible to be done,—not that which is impossible. For example, it is no more possible for God to make something out of nothing than to make *something* and have it *nothing* at the same time. It involves a self-contradiction. It is the same as teaching that because God is omnipotent He can cause a thing to be and *not to be* at the same instant: that he can cause light to be darkness and darkness to be light at one and the same time, and in the usual sense of those words. A favorite illustration with Joseph Cook is that Almighty power can not open and shut a door both at the same instant

and in the same sense! Hence omnipotence signifies the power to do only the possible. Maintaining that God can not accomplish that which involves an absolute self-contradiction, no more detracts from His omnipotence that it limits His infinite power of volition to assume with the Bible that it is *impossible for God to lie*, or that He *can not deny himself*. To say that these are impossible because they are contrary to His moral character, and that he could not lie without ceasing to be God, in a moral sense, is true. But if he is omnipotent in the absolute sense, why could He not *lie* and make it the *truth* for the time being, as well as to convert nothing into something? The writer in *The Evangelist* ought readily to conceive of omnipotence making a lie signify the truth, since he says: "I can *conceive* of a being that is able to create or make *something out of nothing*; therefore any being that can not do this must be *less than omnipotent*. No, no, Brother Wilford! We must respectfully decline to comply with your kind advice to remodel that article or expunge it from the Westminster Confession of Faith."

Now we should consider ourself well on toward omnipotence if we were capable of such a conception, for it is about as difficult as to accomplish the thing conceived. If absolute self-contradiction is no barrier in the way of this writer, let him test his mental powers by conceiving of God's ability to set bounds to infinite space, so that distance shall cease to extend beyond a certain limit! Or, let him conceive of God's ability to put an abrupt end to duration, by the exercise of omnipotent power! *The Evangelist* has assuredly taken a large contract on its hands, if it proposes to prove that omnipotence means the ability to do anything, and even that which is manifestly and inherently impossible to be done.

The truth is, we utterly fail to see the necessity for any such unreasonable assumption, either in science or theology. If it be true that God, as an intelligent being, is a real and substantial entity, and at the same time omnipotent, we see not the least necessity for the assumption that He created the universe out of *nothing* in any absolute sense of that term; and we strongly suspect that the intelligent framers of the Westminster Confession had no such absolute conception of the term "nothing" when they adopted that article. We have heard it urged by an able defender of that revered formula of religious faith, that its framers meant only to teach as Paul taught, that the worlds were not made of things that do appear,—or, in other words, that they were made of an atom, so to speak, of the invisible substance constituting God's exterior and self-

existent nature. It is a grand and sublime conception to entertain of the uncreated I AM, that before the worlds were He was the Sole-existent as well as the Self-existent, and that no substance or thing was his competitor in the boundless realms of space. If "nothing," in the absolute sense, were of such a nature that God could change it into *something*, then it must have been exactly equivalent to *something*, so far as concerned the Almighty; and the existence of such kind of "nothing," co-eternal with Deity, would have detracted from His glory and dignity just as much as would the existence of a material world that he had not created. In what, then, consists the difference between the self-existent "nothing," of which this writer in *The Evangelist* is capable of conceiving, as having been changed into a world, and the self-existent co-eternity of the world itself? We confess we are not equal to the discrimination. Hence we conclude that substance of any kind (or its equivalent, "nothing," capable of such conversion), could not have been eternal, only as identified with God's own entitative existence. It in no wise, therefore, detracts from God's perfection or glory to conceive of an atom of His exterior nature evolved or transformed into this trifling universe,—trifling as compared to the immensity of God's omnipresent being. We concur fully with Joseph Cook, that "matter is an effluence of the Divine Nature," and that "all matter, as well as all finite mind, originated in Him," and that "God evolved the seen universe of matter and the unseen of finite force from himself," as quoted at page 34, *Problem of Human Life*. The aim of that book, as well as the aim of this paper, is to show that science and religion are not only consistent with each other, but that both are consistent with enlightened reason. This we believe to be the only basis upon which thinking men can ever be made to acknowledge the claims of religion; and the quicker ministers of all denominations recognize this state of facts the quicker will a true revival of Christianity throughout the land begin.

"KIND WORDS NEVER DIE."

PROF. I. L. KEPHART, A.M. (for many years professor of physical science), Lebanon, Pa., writes:—

"I am not in the least losing my interest in your great work, but am noticing with much satisfaction the rapid advance of your ideas. I firmly believe that in the not distant future the scientific world will have to admit that the wave-theory of sound has no foundation in fact. It must come to this, for truth is all on

your side. I admire *The Microcosm* for its tremendous, sledge-hammer blows, dealt at the self-opinionated scientists whose theories you have overthrown. You have driven them to the wall, and your well-aimed arrows of scientific truth have transfixed them there. God bless you, and give you strength for the future conflict that evidently awaits you, when the great scientists reviewed shall be forced from their hiding-places. But you need not fear. Truth must and will triumph. You are doing more to compel scientific men to think for themselves, and to drive scholars out of the old ruts of thought, than any ten universities in this land. To the extent that I am able to aid you, I am at your service."

Rev. C. B. Mitchell writes:—

"MARION CENTER, KANSAS.

"Dear Sir: In reply to your editorial for advice, I freely say, the more of *The Microcosm* the better. It can not be enlarged too much, nor its price of subscription raised so high that I will not take it. If my 'collateral' runs low, I will dispense with the New York *Christian Advocate*. May the Lord bless you in your noble and telling work. Yours,

"CHAS. B. MITCHELL,

"Pastor of the M. E. Church."

Rev. F. C. Davis, Huntsville, Ala., writes:—

"The scientific world is already startled at the crash of the infidel strongholds which have begun to crumble under the telling blows given in *The Problem of Human Life*. I am a Missionary Baptist Minister, laboring as Evangelist in North Alabama. I will do all I can to circulate your book and paper. May the Lord preserve you, keep your mind clear, give you strength and wisdom to grapple with those master-problems which have shaken the Christian world and caused many to make shipwreck of the faith, and thus enable you to demolish utterly the erroneous theories you have assailed.

"I am, fraternally, your unknown friend,
"F. C. DAVIS."

Prof. R. D. Swain (professor of mathematics in Ewing College, Ewing, Tenn.) writes:—

"I pronounce your solution of the 'hoop puzzle' correct. I am anxious to see your solution of the 'top problem.' I am with you on the 'Infinite divisibility of matter.' I do not believe there is such a thing as the *least quantity* of matter. The molecular theory, though advocated by our best scientists, is, if not materialistic in its tendency, exceedingly shaky. Your book and paper will do much good.

"R. D. SWAIN."

Rev. Dr. L. W. Bates, Lynchburg, Va. (who wrote the first notice of *The Problem of Human*

Life, beginning, "This is the book of the age," in *The Methodist Protestant*), now writes:—

"A WILFORD HALL.

"*My Dear Sir: The Microcosm* is a gem of the first water, and I rejoice at its increasing circulation, and at the stir *The Problem of Human Life* is creating in the world. At the present rate of discussion and conversion, Professors Tyndall, Huxley, Darwin, and company, will soon be forced to notice the book. No man, except yourself, can be better pleased than I am at the progress being made.—As ever, yours,
L. W. BATES."

Rev. L. M. Olmsted (author of that beautiful book, *Walks and Words of Jesus*) writes from Norwalk, Conn:—

"For weeks past I have been carefully reading your unparalleled book, *The Problem of Human Life*, and with most intense and constantly increasing interest. Had I command of language in which to express my appreciation of this masterly production, I would attempt it. But words fail me, and I stand amazed amid the ruins of the grand temple of so-called science, reared by the persevering efforts of the six greatest scientists of the age. I look upon your work as I would upon a lighthouse on a rock-bound coast where the tempests rave, the thunders break, and the billows dash.—Faithfully yours,

"L. M. OLMSTED."

Rev. W. D. Shea, Texarkana, Texas, writes:—

"I write to thank you for the sample copy of your invaluable paper—*The Literary Microcosm*. I am delighted with your work, and see before you a field of usefulness, over which no other Boaz and his reapers have ever yet gone. I will send the copy you sent me to a friend, and you will please send me the paper from the commencement. I can not see how any minister in this skeptical age can afford to be without the help you so liberally furnish. I shall do all in my power to circulate both *The Microcosm* and *The Problem of Human Life*. Write on, work on, fight on, and you will help many who are faltering in doubt to exclaim 'Eureka!' God bless you always.

"W. D. Shea.

"Pastor M. E. Church, South."

Dr. C. H. Balsbaugh, Union Deposit, Pa., writes:—

"*Beloved Wilford: The November Microcosm*, just read, has awakened my inner being to the importance of the work you are doing. It is so God-interpreting and comforting that I clapped my hands for joy. Reppert is pulverized, as by the Rock of Ages; and the editor of *The Independent*, who gloried in his own shame by condemning a book without reading

it, is justly scarified by your rebukes, so that all men will hereafter know him. I am not surprised that your readers are in raptures over your magnificent monthly. It is the Providential cream of the centuries, and I cannot but regard God himself as editor and proprietor, and that you are but His amanuensis. I pray you to be humble and joyous in your responsible and exalted work. I have no hesitation in believing that *The Microcosm* is already the leading Christian journal of the world. The great Armageddon of this day must be fought out in the realm of science. Opposition to God has entrenched itself in atoms, and molecules, and forces, and correlations, and modes of motions, and monera, and monkeys. You are forcing its apostles to show their colors. Blaze away, my noble friend, and God will make your triumph complete."

Rev. T. W. Mellichamp, Ridgeway, S. C., writes: "Your *Literary Microcosm* has awakened strange expectations, and revived our drooping spirits. The evolution Goliaths have so long defied the armies of the Living God that our hearts have been made sick, and deferred hope has long been going with its head bowed down; and in our despondency we have been tempted to say, There is no Son of Jesse with sling and stone to go out and meet these blasphemers. But at last our hopes have brightened; and we thank God first, and then thank Wilford. Infidelity floods our country; but by the aid of this work we are encouraged to believe that an irresistible pier can now be raised against it."

Rev. John Branch, Plainview, Ill., writes: "*The Literary Microcosm* has just reached me, for which I most sincerely thank you. The first article is *invaluable*. I read it as I never read anything human before. I must have your book, *The Problem of Human Life*; but I send this without waiting, to express my profound gratitude and gratification."

A VOICE FROM ENGLAND.

Several of our readers have asked what the English press have to say about *The Problem of Human Life*. Till within the last few months no copies of the revised edition have been sent to England. The impression the work makes, however, may be guessed by the following from an editorial notice in the old-established *Christadelphian*, of Birmingham:—

A NEW IDEA IN SCIENCE.

"Since writing the notice, 'A New Crusade,' &c., on page 467, last month, we have read the book referred to by Brother Burd. At that writing we had only read the first number

of *The Microcosm*. We have now read *The Problem of Human Life, Here and Hereafter*. Notices of it, in papers and by readers (praising it in unmeasured terms, as marking a new era in science) we had thought the exaggerations of partizan enthusiasm. We have entirely changed our minds. The book is unquestionably a rouser, and its appearance a great event. It is a square, front, fearless attack on Huxley, Darwin, Tyndall, Haeckel and Co., scientifically conducted on scientific grounds. It knocks them topsy-turvy in an unmistakable manner. We have not enjoyed any book like it since we read *Elpis Israel* about thirty years ago. The ability of the book is something almost phenomenal; the cogency of the argument is thorough; its diction lucid as the crystal; its masterly reasoning is spiced with just enough banter of opponents to relieve the solid argument of undue heaviness.—a banter which, however, frequently breaks out into sledge-hammer blows that are simply crushing.

"The aim of the book is to show the scientifically unfounded nature of the modern theory of sound, and above all, of the Darwinian theory of evolution. The success of the attack is complete. The discredit he throws on modern scientific prestige, especially in its attitude toward revealed truth, is unanswerable, confounding, crushing. The book is refreshing,—edifying, almost every way. We have thanked God for its publication. It will bring tears of joy to many cheeks, where faith, not killed, has nevertheless, had a hard fight against the freezing effects of the pretentious science of the 19th century. They will feel this book as a breeze from tropical lands, thawing the icicles, and setting the stiffened arm free for vigorous work. . . . There can be no question that this book truly marks a new era in science."

The editor of *The Christadelphian*, Rev. Robert Roberts, writes to us in a similar strain. We quote a few sentences from his letter:—

"I have read your book *The Problem of Human Life*. You must be surfeited by this time with encomiums. I indorse the most extravagant things that have been said about it in the United States. Its appearance is a great event of Providence. I do not write now to deliver myself formally concerning it; but to say that I want you to send me one dozen copies of *The Problem* by first steamer.

"I conclude by thanking you with all my heart, for your triumphant and irretrievable overthrow of Darwin, Huxley, Tyndall & Co. I have not had so great a treat before, for many a year."

OUR "THUNDER-PUZZLES."

ELDER JOSEPH FLORY, Mound City, Mo., correctly answers the second puzzle stated in

the November number of *The Microcosm* as to the true cause of the long-continued rolling sound of thunder. It is explained by the difference in distance from the listener of the separate portions of the electric flash. For example, if a flash begins five miles away and travels four miles toward the listener, the sound from the termination of the flash would be heard about twenty seconds before that from the commencement of the flash could arrive. Yet the sound would continue all the time, of more or less intensity according to the density of the strata of clouds through which the bolt traveled. This is undoubtedly the correct solution. No correspondent, however, has attempted to answer the first "Thunder-Puzzle" given in that number. We have tried it ourself, in another column of this paper.

SPONTANEOUS GENERATION.

THE New York *Sun* recently gave a lengthy description of the experiments of a prominent scientific investigator in this city—a believer, of course, in Prof. Haeckel's theory of spontaneous generation—in which the learned Professor narrates his process by which he claims to demonstrate that life can be generated in fluids in which all living germs have been destroyed by heat, and from which they have been completely excluded by sealing with a blowpipe while the contents are at boiling temperature.

In reading the detailed description of these experiments, we observed with some interest that the Professor did not pretend to show the forms of living bacteria within these sealed vessels, but exhibited the discoveries after taking out a drop of the liquid, placing it in the slide of his microscope, and then focussing his instrument upon the decoction. He forgot to remind the reporter who interviewed him, that all this took a couple of minutes or so, and that during this period the fluid was exposed to the outside air, in which myriads of the germs of bacteria and other minute animal forms are constantly floating. He forgot also to explain that only a few minutes constitute a very long life-time to one of these almost infinitesimal creatures, and that its full time for hatching from an egg or floating germ so small that no microscope will be powerful enough to reveal it, and then for developing into an aged bacterial monster, would be less than a single minute! Yes, in this trifling interval of time, while the drop of fluid was being conveyed from the bottle and adjusted under the lens, many thousands of such living monads might be hatched and developed to maturity, and

even live through a lifetime much more extended to them in proportion to their size than would be that of the elephant which dies at the age of a hundred years. Yet it seems to be the style of modern science (!) thus to blunder over such fatal gaps in making important experiments, and to reach conclusions which a careful consideration of all the circumstances would have avoided, and shown to be without foundation in fact. What nonsense, then, to go to the trouble of preparing animal or vegetable decoctions, sealing them in vessels while boiling, and keeping them sealed for weeks, in order to determine the question of spontaneous generation, and then spoiling the force of the experiment by allowing a full lifetime of these infusorial animals to transpire in the open air, exposed to countless floating germs while removing the decoction from the bottle to the microscope!

Scientists who think that these bacterial animals, found developed in such prepared infusions, are spontaneously generated without previously existing germs, would soon undeceive themselves if they would reflect upon two distinct facts connected with these supposed new forms of life. First, that they are, many of them, at least, as perfectly organised as is a common fish or lobster. Second, that when exposed to the same surrounding atmosphere the same organic forms appear, time and again, whenever the infusion is exposed. If these animals are really spontaneously generated without the nucleolus of a previously existing germ possessing a vital organism as the pattern and guide for the corporeal structure, then how do such complex organisms get their form and adaptation of parts at the first impulse of blind natural laws with such overwhelming evidence of design in every detail of their structure? And how is it that these blind laws manage so ingeniously and accurately to copy the patterns before seen in countless experiments without one original feature or variation in their organic structure? Any one who can believe that a mindless and will-less system of natural laws, without the aid of previously existing organic germs, can accomplish such feats of exact imitation while spontaneously generating living creatures, ought to find no difficulty in accepting revelation, with all the miracles believed in by Jew or Christian. Let these experimenters, who so confidently prepare decoctions for evolving life by spontaneous generation, give us something fresh in the shape of new forms of organic being, and just once leave out the old patterns of tiny wigglers, as the law of chances would necessarily require, if the process be really spontaneous. Should new organic forms appear every time the ex-

periment is made, and without once presenting the same old patterns of infusoria and bacteria, spontaneous generationists will then have made a point in their favor. Until, however, something approaching this can be shown, it is worse than a waste of time to experiment with infusions under the supposition that organized beings can be generated without previously existing germs, or else the miraculous interposition of an intelligent power above Nature.

SOUND-INTERFERENCE.

In the October and November numbers of *The Microcosm* we treated somewhat exhaustively the two phases of the wave-theory, as illustrated by the effects of *magazine explosions*, and by the experiment of a *tin tube and lighted candle*, as given in Prof. Tyndall's *Lectures on Sound*. We will now examine another phase of that question—the law of *interference* in so-called sound-waves—by which it is claimed that two systems of sonorous undulations may so travel together as to neutralize each other, and thus produce “absolute silence.” There is no doubt in regard to this law of interference being the undisguised teaching of the current theory of acoustics, as will soon appear from statements made by the highest living authorities on the subject. In fact, this law of interference is essential to the very nature of wave-motion, and consequently the wave-theory of sound could not exist and be inculcated as a consistent theory of science without including this basic feature. Hence we are forced to the conclusion that the truth of the current view of sound depends essentially upon the practical correctness of this law.

Acousticians, in illustrating sound-interference, refer to the well-known phenomenon of two systems of water-waves traveling together in such manner that the crests of one system will fall into the furrows of the other system, thus neutralizing each other, and thereby producing a comparatively level surface of water. This real and practical interference is evidently true of water-waves, because here we have actual wave-motion; and if the theory of acoustics were correct, it is evident that two systems of sound-waves, sent off from two unison instruments *placed half a wave-length apart*, would travel in a similar relation to each other,—the condensations of one system coalescing with the rarefactions of the other system,—thus neutralizing each other and producing silence. No wonder, then, that advocates of the wave-theory actually teach that such must be the effect of sounding two unison instruments half a wave-length apart. How

could they teach anything else, if sound is constituted of air-waves which travel "exactly in the same way" as water-waves, to quote the words of Prof. Helmholtz? If the theory be true, silence must necessarily follow such coalescence of the *condensations* of one system with the *rarefactions* of another system of sound-waves. But if no such result as silence, nor any approach toward it, takes place, then the wave-theory is false, as a matter of course.

In our examination of the other phases of this theory, in order to expose their fallacy, we have always allowed the best exponents of acoustical science to make their own statements of the principles and laws involved, and in their own language. We will do so in the present case. Before presenting our arguments, therefore, against this law, we ask the reader to examine carefully the following instructive and concise statements by Professors Tyndall, Helmholtz, and Mayer, the highest living authorities on Sound.

1. "A sonorous wave is *always* formed of *two parts*,—one half of air in a state of *condensation*, the other half of *rarefied* air."—Prof. Mayer, Article on Sound, in *American Encyclopedia*.

2. "A *condensation* and a *rarefaction*, then, are the constituents of a wave of sound." "When I speak of a sonorous wave, I mean a *condensation*, and its associated *rarefaction*."—Tyndall, *Lectures on Sound*, pp. 5, 69.

3. "The *crests* of the waves of water correspond in the waves of sound to *spherical shells where the air is condensed*, and the *troughs* to *shells of rarefaction*."—Helmholtz, *Sensations of Tone*, p. 14.

4. "Figure clearly to your minds a harp-string vibrating to and fro. It *advances*, and causes the particles of air in *front* of it to *crowd together*, thus producing a *condensation* of the air. It *retreats*, and the air-particles *behind* it *separate* more widely, thus producing a *rarefaction* of the air."—Tyndall, *Heat as a Mode of Motion*, p. 225.

5. "The length of a wave is measured from the center of one condensation to the center of the next one."—*Lectures on Sound*, p. 79.

6. "In water, the length of a wave is measured from *crest* to *crest*; while in the case of sound, the wave-length is given by the distance between two successive condensations. In fact, the *condensation* of a sound-wave corresponds to the *crest*, while the *rarefaction* of the sound-wave corresponds to the *sinus* of the water-wave."—*Ib.* 62.

7. "We have here a phenomenon [sound interference] which, above all others, characterizes wave-motion. It was this phenomenon as manifested in optics, that led to the undulatory theory of light, the most cogent proof of that theory being based upon the fact that, by adding light to light we may produce darkness, just as we can produce silence by adding sound to sound."—*Ib.* p. 259.

8. "In the case of water, when the *crests* of one system of waves coincide with the *crests* of another system, higher waves will be the result of the coalescence of the two systems. But when the *crests* of one system coincide

with the *sinuses* or *furrows* of the other system, the two systems in whole or in part destroy each other. This mutual destruction of two systems of waves is called *interference*. The same remarks apply to sonorous waves. If in two systems of sonorous waves condensation coincides with condensation, and rarefaction with rarefaction, the sound produced by such coincidence is louder than that produced by either system taken singly. But if the condensations of one system coincide with the rarefactions of the other, a *destruction, total or partial*, of both systems is the consequence. . . . If the two sounds be of the same intensity, their coincidence produces a sound of *four times the intensity of either*; while their *interference produces total silence*." *Ib.* pp. 284, 285.

9. "Suppose a stone to be thrown into a piece of calm water. Round the spot struck there forms a little ring of wave, which, advancing equally in all directions, expands to a constantly increasing circle. Corresponding to this ring of wave, sound also proceeds in the air from the excited point. The process in the air is *essentially identical with that on the surface of water*. . . . The process which goes on in the atmospheric ocean about us is of a *precisely similar nature*. . . . The waves of air, proceeding from a sounding body, transport the tremor to the human ear *exactly in the same way as the water transports the tremor produced by the stone to the floating chip*."—Helmholtz, *Sensations of Tone*, pp. 14, 15.

To illustrate the foregoing general laws of the wave-theory and to prove that they are scientifically and practically correct, Professor Tyndall in his *Lectures on Sound* presents a figure of two unison tuning-forks called A and B, the wave-lengths of whose sound were exactly 52 inches from condensation to condensation. He first places the forks (in his cut, of course, for he never could have tried the experiment) a full wave-length apart, and in this way illustrates the augmenting effect of coalescence of the condensations from one fork with the condensations from the other, by which, as he claims, fourfold intensity is produced, according to the wave-theory. He then places the same forks half a wave-length (26 inches) apart, and declares that in this position the condensations from one fork will coincide with the rarefactions from the other, and that in the line of the two instruments they will neutralize each other and produce silence. Not to tax the credulity of the reader too strongly, by asking him to take our word for this puerility as the real teaching of the theory, we quote the exact words of Professor Tyndall, as he explained the effects of the two forks if sounded a whole or a half wave-length apart, as follows:—

10. "Now let us ask what must be the distance between the prongs A and B when the condensations and rarefactions of both coincide. A little reflection will make it clear that if the distance from A to B be equal to the

length of a whole sonorous wave [52 inches, with the tuning-forks he was using,] coincidence between the two systems of waves must follow, and consequently a *reinforcement* of the sound of one fork by that of the other. . . . But if the prong B be only *half* the length of a wave behind A [26 inches], what must occur? Manifestly the *rarefactions* of one of the systems of waves will then coincide with the *condensations* of the other system, and *we shall have interference,—the air to the right of A being reduced to quiescence.*—*Lectures on Sound*, p. 259.

We have thus quoted somewhat largely from authorities, that the true drift of the teaching of the current theory of acoustics may not be misunderstood. There evidently need be no ground for misapprehension, with these clear citations before the reader. This principle of "interference" is, more than anything else, a fundamental law of the theory in question, and, as just quoted, so inseparable is it from the very idea of wave-motion that the undulatory theory of light naturally grew out of it. Professor Tyndall declares, as seen above, that the "most cogent proof" of that theory is the fact that two systems of light-waves brought into interference will produce "darkness," just as two systems of sound-waves in interference will produce "silence." But if there be no truth in the law as relates to sound, then surely the undulatory theory of light is based on a fallacy, since it grew out of sound-interference, and hence this "most cogent proof" of supposed interference of light-waves will have to be explained on some other principle, just as the supposed interference of puffs from the two disks of the double siren is so easily explained without resorting to this law of "interference," as the reader will see at the close of this article.

Fortunately it requires no complex apparatus to test the correctness of this law of "interference," as it relates to sound, in repeating the very experiments described by Professor Tyndall. For example, if we sound his two unison forks, or a couple of common A-pitch-pipes, or any other unison instruments, half a wave-length apart, we will find by the most critical observation that they will be heard in all directions precisely the same as if sounded a full wave-length apart! The startled reader may ask, Is this really the case? We answer, It is. Not a shade of difference in intensity will be detected in any direction, or with the two instruments any distance from each other. This we have tested in every possible way, with many different kinds of instruments, obtaining the same uniform result, and thus proving that this law has no foundation in true science. We know the law to be true in the action of water-waves, for in such case we

have true wave-motion. Yet by practical tests, prosecuted for years, we have demonstrated this law to be so outrageously false with regard to sound, that we have been excited to pity for the learned savants who could so recklessly mislead the entire scientific world by incorporating such philosophical nonsense in their text-books. They have manifestly done this without trying one single experiment: for let any student who doubts our statements, or who has even a faint suspicion that this law of "interference" has any existence in fact, provide himself with two A-pitchpipes in exact unison, and have them first sounded by two assistants 30½ inches apart (this being the wave-length of that pitch of tone, counting 440 vibrations to the second, and the velocity of sound 1120 feet), and let him listen carefully while the two pipes are thus sounding in an open field, to avoid reflections, changing his position in all directions from the instruments, to detect any possible difference in intensity. Then let them be sounded half a wave-length apart (15¼ inches), while he observes, as before, in all directions, and we here assert that not a shade of difference in the intensities of the pipes in their different positions, or in different directions from them, will be observed. Yet this ridiculous law, so easily overthrown by two little children with unison penny whistles, is gravely taught as science in all our colleges and universities, and seriously formulated in our standard text-books, because a certain theory of science requires it, while professors of physic have not the courage and manliness in their high calling to repudiate this law before their classes even after its fallacy has been exposed and pointed out to them.

In our conversations with Professor Robert Spice, the quite eminent public lecturer on acoustics, he insisted that this law must be correct, or it would not be so positively laid down in the text-books, and so universally taught as science in our colleges. To show him it was not correct, a practical test was suggested. We then together sounded two unison tuning-forks, just as Professor Tyndall describes the experiment, first a whole, and then a half wave-length apart, and he confessed that there was no difference in their intensity observable in any direction while thus sounding. But he tried to attribute this manifest want of interference to sonorous reflections in so small a room. It was not then convenient for him to go with the writer to an open field to test the sound of these forks, or that of other unison instruments; but he frankly admitted, then and there, that if the sounds should be observed the same in an open field, where there could be no reflection, it would completely overthrow the

wave-theory of sound. Yet this same professor of physics continues to teach the wave-theory in his public lectures before the schools and colleges of the country, rather than take the trouble (or more probably the risk) of trying this simple experiment in some vacant lot! Or possibly he feels, what we have long suspected, judging from his remarks about us to certain of our friends, that if he should incorporate into his lectures his real convictions, and thus expose the fallacy of the wave-theory of sound, the boards of management of the different schools and colleges who have hitherto employed him would dispense with his lectures. Many professors of physics, in private conversations, to our knowledge, have admitted that the wave-theory has been fairly and hopelessly broken down, yet, with a few exceptions, they seem, like Professor Spice, to lack the courage to avow their convictions publicly. Such is the tyranny with which an established theory of science lords it over the souls and shackles the minds of those who have long taught it, especially when such theory has upon it the stamp of names like those of Professors Tyndall, Helmholtz, and Mayer.

But this law of interference is not only false,—it is self-contradictory in the highest degree. It assumes that the prongs of two unison forks, when sounded near each other, will necessarily swing in the same direction at the same time, so that each will send off condensations simultaneously. This must be the supposition, since the condensation from one fork must reach the other fork when it is placed a wave-length distant, just as the latter's condensation starts, which it evidently would not do unless the prongs of the two forks moved in the same direction simultaneously! As the prongs of two unison forks, when sounded together, are just as liable to swing in opposite directions as in the same direction, the so-called interference would be just as liable to occur with the two instruments a full wave-length as a half wave-length apart. This is perfectly manifest. See our last quotation from Professor Tyndall. But as no interference ever takes place between two forks, whatever distance they may be apart, if sounded a thousand million times in succession, the law is thereby proved to be not only self-contradictory, but a practical fallacy.

Look at the fourth quotation, about the action of a harpstring. This string makes a *rarefaction* of the air on one side by the same motion; and, of course, at the same instant that it makes a *condensation* on the other side,—thus sending off two systems of unison sound-waves as it oscillates to and fro—one system in each direction. Now, these two systems of

air-waves must react in an upward direction, since the sound is heard above the harpstring (supposing it to be stretched horizontally), the same as in the direction of its lateral swings. But as the *rarefaction* on one side of the string travels upward with the same velocity as the simultaneous *condensation* produced by the same motion of the string on its other side, here is a case of absolute interference of sound-waves at all points above the string, since the *condensations* of one system of air-waves must unavoidably coalesce with the *rarefactions* of the other system; and hence, the two systems being exactly equal, should, as Professor Tyndall declares, produce "total silence." (See the eighth quotation.) As the sound, however, is heard the same above the string as at its sides, it demonstrates the law to be totally false; and with this demonstration the wave-theory necessarily breaks down. The boast, therefore, that this law of interference has been mathematically formulated and demonstrated to be true, tends not only to render the whole theory ridiculous, but to cast discredit upon the pretentious claims of these great authorities upon every other branch of physical science upon which they have written. If they have erred so egregiously upon phenomena that are simple, patent, and self-evident, what confidence can be placed in their learned deductions involving abstruse and intricate problems? The truth is, and the careful student will soon be forced to accept it, that it is not all science that formulates, any more than it is all gold that glitters. The more this subject is investigated and sifted, the more manifest it will become that the wave-theory of sound is a formalization of scientific absurdities and philosophical incongruities; and we may confidently look for the general recognition of this truth among scientific men in the not distant future.

But one other matter, before closing. Professor Tyndall tries to prove the correctness of the law of interference by an experiment with the *double siren*, in which he makes one of the sorriest exhibitions of his want of acoustical knowledge recorded in his *Lectures on Sound*,—even surpassing his tin-tube fiasco, discussed in the November number of this paper. Briefly, he caused the two disks of the double siren (secured to the same spindle, and having twelve holes each) to revolve rapidly, in such relation to each other that the twelve puffs of air from one disk should occur simultaneously with the twelve puffs from the other disk. Thus, with twelve revolutions of the spindle per second, it is plain that 144 pulses or puffs per second from each disk would be produced, thus generating a powerful tone of a corresponding

pitch. He then shifted one of the disks, so that its twelve puffs should occur alternately with, or in intervals between, the twelve puffs of the other disk, thus actually producing 24 puffs at each revolution, or 288 puffs in the twelve revolutions of the spindle per second. Now, what was naturally to have been expected from this simple change? Why, a beginner in acoustics could have told Professor Tyndall that this doubling the number of pulses from 144 to 288 in a second would necessarily raise the pitch from the strong fundamental to the weakened octave. But, strange as it may seem, this simple and self-evident result never occurred to the mind of our greatest English physicist! On the contrary, he actually supposed that this was a veritable case of *sound-interference*, and the long-sought "cogent proof" by which to establish the undulatory theory of light. He positively mistakes this normal *octave* for "*silence*," which he had assumed in advance would be caused by the interference of the two disks. Hence, in his attempted explanation of the effect of this change, he shows the most lamentable, and even pitiable, confusion and self-contradiction ever exhibited by a scientific lecturer. He first asserts that it had produced the "absolute extinction" of the sound, and then admits immediately after that the two disks still produce a "distinct sound"! He flounders around among the theoretic "condensations" made by the one disk and the "rarefactions" produced by the other to get the cause of this weakened and elevated tone, not realizing that it was simply produced by doubling the number of vibrations, the only practicable way to change from a fundamental tone to an octave. At last he stammered out the word "octave" as if by accident, without realizing or having the faintest scientific conception that this octave, thus produced in the natural way, was the whole explanation of the change of tone when the puffs were increased from 144 to 288 to the second. But we must treat our readers to his exact words, as a brief specimen of the quality of "science" now dealt out to fifty thousand young men in the colleges and universities of this country. Here it is:—

"It is *plain*, therefore, that the *intervals* between the puffs of the lower siren, which correspond to the *rarefactions* of the sonorous waves, are here filled by the puffs or *condensations* of the upper siren. In fact, the *condensations* of the one coincide with the *rarefactions* of the other, and the *absolute extinction* of the sounds of both sirens is the consequence. I may seem to you to have exceeded the truth here; for when the handle is placed in the position which corresponds to *absolute extinction* you still hear a *distinct sound*. . . . Now, by turning the upper siren through one

twenty-fourth of its circumference [so that the two disks will puff alternately], we extinguish utterly the fundamental tone. But we do not extinguish its *octave*!"—*Lectures on Sound*, p. 291.

"It is plain" that the wave-theory required the two systems of puffs to neutralize each other and produce silence. Hence, Professor Tyndall actually declared, in defiance of the ears of all the students present, that "the *absolute extinction* of the sounds of both sirens is the consequence." But, no doubt, noticing the countenances of the students who heard the octave piping out, he takes it all back, and, in manifest confusion, says, I must confess I have "exceeded the truth"! He then admits the "octave" (weaker, of course, than the fundamental tone) the very thing and the only thing he ought to have expected,—thus flatly contradicting himself about "absolute extinction"!

Professor Helmholtz, the inventor of this improved double siren used by Professor Tyndall, really shows the same unaccountable and incoherent misconception of the effects of alteration in the puffs of the two disks, proving beyond a doubt that even he did not possess a true idea of the acoustical effects of his own favorite instrument. This is a startling charge, but its justice is shown in ample detail in *The Problem of Human Life*, beginning at page 286, to which the reader is referred, as we have no more space here to elaborate it.

In our next article upon this subject in *The Microcosm*, we will take up the question of *tympanic vibration*, and will point out to the reader the astonishing fallacy of the wave-theory as based upon that impossible supposition as the means by which the sensations of tone are conveyed to the brain.

DISTINGUISHED MEN—No. 3.



JOHN TYNDALL, the subject of this sketch, was born in the village of Leighlin Bridge, Ireland, in 1820. He is consequently now 62

years old. Though a native of Ireland, he descends from the old English stock of Tyndales who settled in Ireland about the middle of the seventh century. As was the case with young Huxley, few educational advantages favored the development of young Tyndall's mind. His father was poor, but endowed with great energy of character, which was about all the inheritance, save that of a brilliant intellect, he was able to bequeath to his son, who has since risen, by his individual and almost unassisted efforts, from the obscurity of poverty to one of the highest niches in the temple of scientific fame.

A distinguishing characteristic of his boyhood and early manhood was unyielding application to books. When employed for the usual hours of the day in drawing, mapping, teaching, or whatever was for the time his avocation, his constant practice was to occupy the morning hours from five o'clock, and the evening till nine, mastering the most difficult questions of science and philosophy. Twelve years thus employed laid the foundation for his scientific achievements and authorship, which have since made his name so famous. He ever held as his motto that *genius* is simply *labor*, backed by a sound mind and body, and that what has been taken as a remarkable natural gift in many of our so-called great geniuses was nothing but a determined resolution on their part to achieve success, and persistent labor in that particular direction till the result was accomplished.

Among his most intimate scientific friends in early manhood was the great Professor Faraday, whose inexhaustible store of knowledge seemed to be the charm of Professor Tyndall's life for many years. It was fitting, therefore, that he should succeed his eminent master in the chair of natural philosophy in the Royal Institution of Great Britain as he has done, and which he has filled with such distinguished honor for so many years.

Professor Tyndall is especially and peculiarly a *physicist*, by intuition and pursuit. He loves nothing so well as to be engaged in experiments on light, heat, sound, electricity, magnetism, &c., and has written some of the most brilliant illustrated treatises, especially on heat and sound, ever published. He is a voluminous author, and his works on the various branches of physical science have been so eagerly sought after by scientific students that it has necessitated their translation into all the principal languages of Europe. His greatest reputation, however, has grown out of his extraordinary ability as a popular lecturer, as the people of this country had the pleasure of personally attesting a few years ago. He is soci-

ally a noble specimen of a refined and polite gentleman, and a kind-hearted friend; though as a controversialist he is severe and uncompromising in the extreme, as those scientists are well aware who have had the misfortune to cross his path. The name of Professor John Tyndall will live and be fresh in the minds of men while scientific books are read.

A NEW AND BEAUTIFUL BOOK.

We take pleasure in announcing that we have now ready for delivery the Rev. M. N. Olmsted's new Harmony of the Four Evangelists, called *The Walks and Words of Jesus*. As stated last month, no minister or private Christian family should be without this book. As a specimen of the original manner in which Mr. Olmsted has executed his task, by bringing together all that is recorded by the four writers, and weaving it into one harmonious narrative, we copy below a single paragraph from his book, without intimating the parts of the four records from which it is taken; and then repeat the same paragraph, with due credit given in brackets at the commencement of each sentence or part of sentence quoted. This brief specimen will give some idea of the great value and beauty of the Harmony, as well as of the long and careful labor the work has cost:—

Now there was much grass in the place. So the men sat down in ranks, by hundreds, and by fifties, in number about five thousand. And when Jesus had taken the five loaves and the two fishes, and when he had given thanks, looking up to heaven, he blessed them, and brake the loaves, and gave the loaves to his disciples, and the disciples to the multitude that were set down: and likewise the two fishes divided he among them all, as much as they would. And they did all eat, and were filled. When they were filled, he said unto his disciples, &c.

The following is the same, with the proper credits given:—

[John vi. 10] Now there was much grass in the place. So the men sat down [Mark vi. 40] in ranks, by hundreds, and by fifties, [John vi. 10] in number about five thousand. [Mark vi. 41] And when [John vi. 11] Jesus [Mark vi. 41] had taken the five loaves and the two fishes, [John vi. 11] and when he had given thanks, [Luke ix. 16] looking up to heaven, he blessed them, and brake [Mark vi. 41] the loaves, [Matt. xiv. 19] and gave the loaves to his disciples, and the disciples to the multitude [John vi. 11] that were set down: and likewise [Mark vi. 41] the two fishes divided he among them all, [John vi. 11] as much as they would. [Matt. xiv. 20] And they did all eat, and were filled. [John vi. 12] When they were filled, he said unto his disciples, &c.

This is but a fair sample of the entire work: and unless we are greatly mistaken, such a collation of *The Walks and Words of Jesus*,

with its harmonious blending and natural self-interpretation, must be received with joy and gladness by all Christian people, but more especially by ministers, without respect to creed or Church organization.

The book contains 400 duodecimo pages, well bound in cloth, and will be sent, post-paid, for \$1. Agents who may wish to canvass for this book should send at once for a specimen-copy and our special and liberal terms. A beautiful sample-copy of the work, as a premium, will be sent, post-paid, to any one who will send us the names of four new subscribers for *The Microcosm* from the commencement of the volume, with the money, \$2.

Each copy of the book contains an elegant photo-engraved likeness of Mr. Olmsted, the author.

Ministers would find little difficulty in raising a club of subscribers for the work among the members of their congregations, and by this means will secure the books at agents' price. No better home missionary work could be carried on by a minister than to instigate in this manner a thorough re-reading of the sacred record among his people.

Address all orders to HALL & Co., Publishers, 23 Park Row, New York.

THE FORM OF OUR PAPER.

HUNDREDS of our readers, during the last two months, have given their views freely and fully upon the subject of enlarging and changing the form of *The Microcosm*, and increasing the price to \$1 a year. It is the opinion of a majority of our subscribers, so far as we have heard from them, that we had better continue the paper just as it is for the present volume, and extend its circulation, at its present low price, as widely as possible; and at the end of the year change the form to that of a large-paged magazine of 32 pages, with substantial cover, and raise the price to \$1 a year. It is thought by nearly every correspondent that very few of the subscribers to the present volume would withdraw from our list on account of the addition of 50 cents to the price, while many of those who have already paid two years in advance assure us that they would willingly send fifty cents more at the commencement of the second year, if this change is made. Such generosity, however, we have no right to ask, though we feel grateful for the good cheer. At all events, *The Microcosm* will be published so long as the Father wills to keep us in the work; and to the best of our ability will its monthly visits aim to instruct and comfort its readers with messages of true science, true philosophy, and true religion. *The Microcosm* will there-

fore be continued as it is at present for the rest of the year, except so far as we may hope to improve its contents from month to month.

SUCCESS OF "THE MICROCOSM."

[From our December issue.]

NEXT month (January) we intend to issue an unusually large edition of *The Microcosm* to circulate as specimen copies, in celebration of our semi-anniversary. When we commenced this paper many of our friends advised against the venture, as almost certain to end in failure. Some predicted that the paper would not live three months; while others offered to lay wagers that we would never reach 1000 subscribers. For once the wisecracks have lost their reckoning. From the day *The Microcosm* was announced up to the present time **more than one thousand subscriptions a month** have been received: and at the present time, as we go to press, they are coming in at an average of **more than fifteen hundred a month**.

These subscribers are among the most intelligent in the land. About 2,000 ministers, nearly equally divided among all Protestant denominations, with many Catholic priests, are regular subscribers for this paper. Also, hundreds of doctors and professors of colleges.

We have reason, therefore, to congratulate ourselves and subscribers upon the success of our enterprise, which an experienced gentleman of this city, who has been connected with more than twenty different papers, declares to be without a parallel in the annals of journalism. Of one thing we feel especially proud—that we have, in the first half year, more ministers of the gospel reading *The Microcosm* than ever read any other journal, whatever its age or circulation. To this portion of our readers we would here say that if we do not succeed in meeting the views of all (which is, of course, an impossibility), we promise that each number of our paper shall contain food for intellectual exercise and improvement that will at least repay the time spent in its perusal.

☞ Since the foregoing was written, thirty days ago, about two thousand new subscribers have been received, a majority of whom are clergymen. Thus the good work goes on.

TRUE CAUSE OF WAVE-MOTION.

Editor of *The Microcosm*.

In your reply to Professor Reppert, published in the October number of your paper, you gave the true explanation of the reason why water-waves travel from a central point after being started by a falling pebble or other dis-

turbing cause. It is strange that this simple and self-evident explanation has been heretofore overlooked by writers on physical phenomena, as I fail to find an intimation, in all my reading, of this true solution of the cause of wave-motion. Writers, so far as I have seen, like Professor Reppert, attribute it to "action and reaction," produced by the falling pebble, overlooking entirely the true solution as so happily and scientifically given in your reply. Such a genuine contribution to physical science ought at once to attract the attention of physicists.

Your reply to Professor Humphreys, of Vanderbilt University, printed in the December *Microcosm*, just read, is to the same point, and certainly shows, as never shown before, the important part gravity plays in the problems of physical science, and how easy it is for superficial thinkers to be deceived, and draw absurd conclusions in supposing that a wave "moves of itself," as did that eminent professor. You are doing a grand work in exposing the shallowness of such superficial "science," and students of our colleges could not do a better service than to circulate *The Microcosm* among their professors and fellow students—Yours gratefully,

T. S. WILDER.

Chicago, December 10, 1881.

THE OLD AND THE NEW.

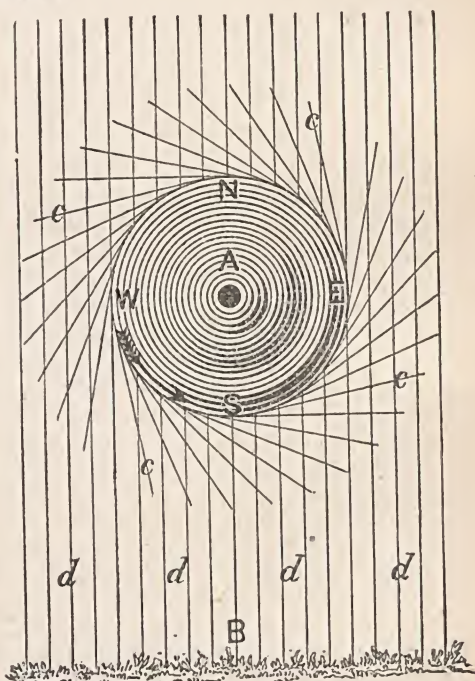
SEVERAL professors of physics have objected to the new hypothesis of sound, on the ground that it would be difficult to teach such a system, and to so present its claims as to bring it within the comprehension of scholars,—whereas the old system, as they claim, having been mathematically formulated, has a fixed scientific basis and something that students can grasp. If this were so, it does not justify the teaching of error instead of truth. But the reverse is actually proved to be the case in every instance where professors have had the independence to think for themselves, abandon the wave-theory, and adopt in their classrooms the corpuscular hypothesis, even in its present crude and unformulated condition. As evidence of this, we quote a paragraph from the letter of an experienced professor of acoustics at Enfield, Ill., Prof. M. A. Montgomery, A.M., as follows:—

"I am very much interested in the work in which you are engaged. I have just finished reading *The Problem of Human Life*, and must say that I have not met with a work for years in which I have been so deeply interested. I am now teaching the theory of sound contrary to my college instruction and contrary to all authorities who have written for the class-

room. I regard the wave-theory of sound as a defunct theory. I find my work as a teacher of acoustics much more interesting, since adopting the corpuscular hypothesis, than it has hitherto been. I find myself thrown very much more upon my own resources than I ever was before when teaching the wave-theory; and pupils appear to grasp the corpuscular view much more readily than they can the old theory. I find also many illustrations come to my aid in every lesson I teach. They are plentiful, and very convincing; and never fail to rivet the attention of the class."

THE PROBLEM OF THE SPINNING TOP.

1. Why does a rapidly spinning top, when tilted, tend to assume an upright position?
2. Why does it swing bodily and slowly around its pivot?
3. Why does this bodily motion take the direction of the revolving surface of the leaning top which is nearest to the ground?
4. And why does this bodily movement of the top become faster as its rotary motion becomes slower?



We have received about one hundred and fifty different solutions of this puzzle since the above questions were first published in the September number of *The Microcosm*, and with two exceptions, the true explanation has been wholly overlooked; and even the two exceptions, though very near the mark, fail on matters so essential as still to leave these peculiar motions of the top an unrevealed mystery.

Rev. Lyman Carley, of Enon, Mass., whose

letter we give below, comes so near the true solution, and being the first to approximate it, that we have awarded to him \$10. Mr. James McCarroll, of this city, is the other correspondent who approaches the true solution, and whose explanation we also give in his own words, with our remarks appended, showing wherein the solution falls short.

It is impossible for us to describe even briefly a tithe of the different theories given to account for the four peculiar motions stated in our questions, as it would require several numbers of this paper to contain even an intelligible synopsis of these answers. We venture to believe, however, that not one in twenty of those who made these attempts was fully satisfied with his solution when completed. Many of these writers attribute the tendency of the leaning top to assume an upright position to the wedging of its lower side against the denser air nearest to the ground, not thinking that a top will spin better, while maintaining all these peculiar motions, in a vacuum than in the densest atmosphere. But the most prevalent and singular error has been the almost uniform explanation given to account for the gyratory or bodily movement of the leaning top around its pivot. Even eminent professors of physics have declared that it could only be due to the rolling tendency of the side of the tapering pivot on the ground as the top leaned over, thus bringing a larger rubbing portion of the pivot than its point in contact with the surface of the ground, like the rolling of a tapering cylinder.

But had these writers given the matter a moment's careful thought, they would have seen that this rubbing motion of the leaning pivot should have caused the top to gyrate or roll around in the opposite direction. As proof of this we have only to observe the top after it falls over, when its rotary motion is about spent, and we will see it make two or three gyrations by rolling backward, or exactly opposite to the direction its bodily motion had taken before falling. We ask every reader who has attempted to solve the problem to reconsider his solution in the light of what we will now give as the correct answers to the four questions.

We present herewith a diagram which will facilitate our explanation. In this cut *A* shows an upper or plan-view of a top with its points of compass indicated by the appropriate letters, and with an arrow showing the direction in which the top is rotating. *B* shows a fraction of the earth's surface, with the rays of gravity indicated by the perpendicular lines, *d, d, d, d*. The rays of centrifugal force generated by the rapid rotation of the top are also shown by the

tangential lines *e, e, e, e*, passing away from the top's periphery all around its surface.

With reference to the first question propounded above, we will suppose the top to be leaning toward the south with the point on its periphery at *S* nearest the ground. Now, first of all, and before any approach toward a satisfactory solution can be given, we are compelled to assume, what is so distinctly maintained in all our previous writings, that *force*, of whatever kind, is *substantial*, though not substance in the grosser or corporeal sense of that term. As distinctly urged in the second chapter of *The Problem of Human Life* and in our editorial article in the December number of *The Microcosm* on "The Nature of Force," a magnet can no more draw a body or push it away without a real substance connecting the two than can a boatman draw his skiff toward the shore without a cord attached, or push it out into the stream without a setting-pole or some equivalent device. A mere *force*, under the insubstantial conception of a *mode of motion* or any such half-meaningless phrase, can no more pull a stone to the earth or a bit of iron to the poles of a magnet than it could pull a boat to the shore or shove it out into the stream. This must strike every thinking man as self-evident.

We thus commence our solution with what we regard as an axiomatic basis of scientific truth, namely, that the rays of gravity *d, d, d, d*, and the tangential rays driven away from the top, *e, e, e, e*, generated by the mechanical energy that causes it to rotate, are as really substance as is the top itself.

In the article on "The Nature of Force," we purposely foreshadowed this solution, as a hint to our readers. The centrifugal rays from the top in thus meeting the rays of gravity neutralize them in exact proportion to the speed of rotation and the directness of their collision one with the other, as shown, for example, in the cut below the west side of the top, or directly under *W*. In their opposite direction, as shown above *E*, they meet with no resistance, as they do not collide with the rays of gravity. Hence, these centrifugal rays, as they come into collision with those of gravity, naturally tend to push back on the top and lift it from a leaning to an upright position, the same as a feeble old man who leans and is about to fall straightens himself up by pushing down upon the ground with his cane.

This answers the first question as to the cause of the upright tendency of the top. But to make it plain by an illustration, suppose the periphery of a large top to be composed of a series of the *north poles* of magnetic bars, with their *south poles* all pointing inward toward

the center of the top. Then suppose a similar series of magnets arranged around the top a short distance from it, but with their *north poles* all pointing toward this magnetic periphery. Now such a top manifestly would not need to revolve or spin in order to stand upright on its pivot, even if that pivot were a needle-point, because the substantial rays of force from the magnets composing the periphery of the top will collide with the contrary rays from the *north poles* of the surrounding series of magnets; and even if the top is pushed over toward the outside magnets in any direction, it will be repelled and forced back into an upright position, and will thus be made to dance and tremble on its pivot, being equally forced away from the other magnets all around it. But who believes that this top will thus balance, and dance on its pivot, or be kept from falling in any direction, unless it is actually pushing out from its periphery invisible setting-poles, so to speak, (like the boatmen in his skiff), to keep it away from the surrounding wall of opposing magnets?

One other remark here, by way of illustration, and to make this matter still more plain. We know and can absolutely prove that there is a natural conflict between the rays of centrifugal force and those of gravity. Bodies are well known to weigh less at the equator than north or south of that line, because the centrifugal rays of force from the earth are naturally strongest at its largest periphery, reckoned from the poles of its axis. Why, then, does a stone that weighs a ton at this latitude weigh less than a ton at the equator? The answer is, because the centrifugal rays from the rotating earth shoot out and partially neutralize the rays of gravity inherent in the stone, and which alone are the cause of its weight. This collision of the two substantial forces tends evidently to weaken the gravity of the stone, since it is clear that if the earth should revolve with sufficient rapidity the stone would weigh nothing at all at the equator, because its rays of gravity, which interlock with the rays of gravity from the earth and thus cause its weight, would be completely neutralized by the other system of rays sent out from the earth caused by its rotation, namely, those of centrifugal force. What can be plainer than this? Thus, by reference to our cut, it will be seen that the tangential rays of force on the west side of the top in projecting downward collide in like manner with the out-shooting rays of gravity from the earth, thus forcing the top to an upright position if its rotation is swift enough to produce the required centrifugal force.

The second question is easily answered if we

will but note the fact that the west side of the leaning top, in its rapid rotation, is falling swifter than gravity can act upon it: hence gravity can not pull on that half of the top, while the east side, going in the opposite direction, is opposing gravity, and therefore is pulled by its full force. Hence gravity does not pull directly downward on the top, but quarterly, or at an angle about southeastwardly. Now, if the centrifugal rays, *c, c, c, c,* are not strong enough to force the top immediately to an upright position in opposition to the action of gravity, it is plain that the top must swing bodily around its pivot to the southeastward, or in the same direction that gravity is exerting its force, until the tangential rays can gradually overcome gravity, and thus bring the top up to a "sleeping" position, directly over its pivot.

The third question is answered by the same explanation. The bodily gyration or swing of the top around its pivot must necessarily be in the direction of the pull of gravity, or toward the southeast, so long as the centrifugal rays, *c, c, c, c,* are not strong enough entirely to neutralize gravity and straighten up the top. Hence the bodily swing must be in the direction taken by the surface of the leaning top nearest to the ground.

But the fourth question is the most difficult as well as the most important, being only solvable by the hypothesis here maintained of the substantial nature of the rays of force. When we first came to investigate this problem, we came to the conclusion, from reason alone, and without having made one experiment to prove it, that the tangential rays *c, c, c, c,* could easily be made powerful enough to entirely and instantly counteract gravity, prevent all bodily swing around the pivot, and force the top at once to an upright position. We drew this conclusion from the observed fact that the bodily motion or swing around the pivot was *slow* just in proportion as the rotary speed of the top was *fast*, and consequently just in proportion as the rays of centrifugal force were powerful, since the power of these rays must be in proportion to the speed of rotation. We saw, on the other hand, that just as the rotary speed of the top slackened, the speed of the bodily swing around the pivot augmented, because the pull of gravity was less and less interfered with by the centrifugal rays. But how were we to demonstrate or prove our conclusion to be correct, namely, that the speed of rotation might be so increased as instantly to overcome gravity, straighten up the top, and thus prevent all bodily movement around its pivot? We could not spin a top fast enough in the ordinary way, and we

could find no intimation of such a possibility in any book in which the motions of the top or gyroscope are explained. Yet reason told us that this must be the case if these rays of centrifugal force were really substantial, and really the cause of finally straightening up the top.

Accordingly, we constructed and arranged a new and powerful mechanical device by which to cause an accurate metal top to spin with a velocity of two or three hundred revolutions a second. The result was this new discovery in mechanics, as here intimated. The top, when thus spun, instantly assumes an upright position without any bodily gyration whatever around its pivot; and if pushed into a leaning position while this high rate of velocity is maintained, it refuses to gyrate bodily, but straightens up at once. What can possibly effect this except the generation of more powerful rays of centrifugal force, — powerful enough to combat and completely neutralize gravity? As no intimation of this new phase of the problem has been given by any of our correspondents, it is plain that no one of them has grasped the real difficulty involved in the fourth question, and consequently that they must have failed to catch the true solution of the problem, namely, the substantial rays of centrifugal force and their neutralizing effect upon the substantial rays of gravity. By the discovery involved in this solution we also add another link to the golden chain of evidence going to overthrow materialism, by proving that the vital force which moves our molecules, bioplasts, and muscles, must also be a real substance, though intangible and invisible to physical sense.

Should any scientist object to our solution as the true one, let him explain in what manner the top composed of magnets, of which we have spoken, will straighten itself up when pushed to one side, and how it will oscillate back and forth upon its pivot without touching anything visible or tangible—anything, in fact save these substantial rays of force. Let him then tell how the gravity of a stone at the equator is partly neutralized by the action of the centrifugal rays projected from the revolving earth. When he shall have solved these two problems to his own satisfaction, he will have demonstrated all force to be substantial, and that nothing pushes the leaning top while spinning, to an upright position, except the projection of substantial rays of centrifugal force darting off from the top as we have explained.

This solution applies equally to the *gyroscope*, which is but a modification of the top. If the gyroscope-wheel were made to revolve fast enough, by means of a powerful mechanical

contrivance, the instrument would not gyrate at all around its pivot, but would seek an upright position; and hence, would, for the time being, cease to be a gyroscope. Such a possibility has never been intimated by the writers who have sought to explain that instrument, and consequently they have never really explained it. Why have they never so intimated? Because no writer had caught the idea of the substantial nature of the rays of centrifugal force which, as we see, may be made so powerful as entirely to neutralize gravity, and thus counteract its quartering or diagonal pull upon the top or gyroscope. It is known to those familiar with the gyroscope that if the wheel and its supporting frame be balanced by a weight placed on its arm extending the other side of the pivot, that the wheel and frame will gyrate in the opposite direction. Why is this? Manifestly because gravity has now nothing to do with its motion save to form a base against which the centrifugal rays, as seen directly under the top, may push, and thus be able to carry the gyratory motion in the reverse direction. Thus we see that the substantial centrifugal rays *e, e, e, e*, clearly account for every movement both of the top and gyroscope.

We subjoin the letters of Rev. Mr. Carley and of Mr. McCarroll, before referred to:—

ENON, Perry Co., Miss.,
Nov. 9, 1881.

Messrs. HALL & Co.—I submit the following solution of your Scientific Puzzle, No. 2.

1. *Why does a rapidly spinning top, when tilted, tend to assume an upright position?*

This is because the rotary motion of the top creates a centrifugal tendency, which so far overcomes the attraction of gravitation that it becomes light; and as the tendency of all bodies, when not confined to the earth by force of gravity, is to rise, so the top, in its effort to rise, assumes an upright position. The centrifugal force being greater at the largest part of the top than anywhere else, it becomes the lightest, and therefore rises the highest.

2. *Why does it swing bodily and slowly around its pivot?*

When the top is inclined, of course the lowest side is the heaviest, being nearest the earth. Now the centrifugal tendency, resulting from the rotary motion, opposes the force of gravity, and therefore this force does not exert its greatest power at the point of the top's circumference nearest the earth, but a little to one side, that is, on the side of the point nearest the earth that lies in the direction of the rotary motion on the lowest side of the top. The force of gravity, therefore, draws the top in that direction. The reason this bodily motion of the top around its pivot is so slow during its rapid rotary motion, is because the force of gravity is at that time but slightly exerted.

3. *Why does this bodily motion take the direction of the revolving surface of the leaning top which is nearest to the ground?*

Simply because the force of gravity, as explained above, is exerted in that direction.

4. *Why does this bodily movement of the top become faster as its rotary motion becomes slower?*

Because the force of gravity is opposed less by the centrifugal force, and is therefore more free to act upon the top. Yours, &c.,

LYMAN CARLEY.

P. S.—I am a minister of the M. E. Church, South, and a member of the Mississippi Conference.

L. C.

133 East Sixteenth Street, }
New York, Nov. 16, 1881. }

Editor of the Literary Microcosm.

SIR: In relation to the proposition concerning a spinning top which appeared in a recent number of *The Microcosm*, I beg to submit the following as the true solution:—

1. The top, when tilted, tends to regain its upright position because of the effort of all the particles in the periphery to resume or maintain the original plane of their motion. It preserves a perpendicular position *while spinning rapidly*, because the tangential force developed so strongly at its periphery generates in all its particles, here, a tendency to fly off at right angles to the line of gravitation, with greater force than gravitation exercises upon them.

2. It swings bodily around its pivot because any deviation from a perpendicular crosses the plane of the tangential force, and must result in the whole body being carried along in the line of the superior force (which meets query No. 3).

4. The bodily movement of the top becomes faster as the rotary motion becomes less, because of the decrease of the tangential force and its becoming more easily merged in the orbital.

Very truly,

JAMES MCCARROLL.

REMARKS.

It will be observed, upon a careful examination of these communications, that neither of our correspondents seems to have caught the essential conception of the substantial nature of centrifugal force, or the part those rays play in causing the peculiar motions of the top. Had they thought of this, they could not have kept it back in such connection. They speak of a "tendency" of the particles of the top's periphery to fly away at a tangent. But this "tendency" can evidently accomplish nothing, unless there is something substantial which really does fly out tangentially and actually push against something else, and thus by back-action straighten up the top. How a "tendency" of the periphery of the top to fly off could satisfy so careful and analytic a thinker as Mr. McCarroll is more than we can imagine. Had he thought that force itself is just as really substantial as is the periphery of the top that thus tries to get loose and fly away, he would have cried "Eureka!" The boatman, he would readily understand, might push against the side of his boat with all his might, and cause a strong "tendency" of its rim to break away,

but this tendency surely would not shove him or his boat a single foot out from the shore. He must actually thrust out a setting-pole or some other real substantial thing against the shore, or his boat will not move.

We thus give what we conceive to be an intelligent solution to our problem by exercising the eyes of the intellect and viewing the substantial but invisible forces as real entities, which they really are. In this harmonious way does Nature open her storehouse of scientific revelation, by which to demonstrate the duality of man; and we may rest assured that she will never refuse to unbolt the door of her secret archives whenever the key of reason is properly thrust into the lock.

MICROCOSMIC DEBRIS.

KENTUCKY is to have a mushroom farm in its Mammoth Cave. It is said there is room enough to produce a million pounds of mushrooms daily.

There are 390 educated female physicians in active practice in twenty-six States of our Union—the majority in Massachusetts, New York, and Pennsylvania.

King Kalakaua is to be made a member of the Legion of Honor. He has sent President Grevy the insignia of the Grand Cross of the Order of Kamehameha.

At Gnossio, in Crete, Prof Stilman has excavated the remains of what he believes to be the historical labyrinth famous from the story of Theseus and the Minotaur.

The completion of the canal around Mussel Shoals, which will happen within two years, will render the Tennessee navigable from Paducah to Knoxville, a distance of 500 miles.

In Sweden the smallest town possesses its open-air band, which plays on a platform or kiosk. In Stockholm there are five or six public gardens where excellent music may be heard in the evening.

Visitors have been very abundant this year in Switzerland. On August 20, 2,000 persons were carried to the top of the Righi by rail, the greatest number that ever ascended the mountain in one day.

It has come to light that under what is known as the Dentists' Act, any one who chooses to register as a dentist can, in England, get off juries, and the number of registered dentists promises to be enormous.

Dr. McCosh is reported by a religious paper to have said that he finds at Princeton a constantly decreasing number of undergraduates in-

tending to be clergymen, and that it is the same in the other colleges.

The approaching census of St. Petersburg will be preceded by a systematic enumeration of the houses as well as of each separate tenement in the city and suburbs. In 1869 the inhabitants amounted to 900,000 souls.

Efforts are making in Bohemia to have the distribution of blood-and-thunder romances prohibited by the government. This species of literature is said to be exercising a pernicious influence upon the population of the country.

Berlin is laying wooden pavements in its streets, notwithstanding the many unfortunate experiments made with them in other cities. The grateful noiselessness of travel over them is what commends them to the German authorities.

Baron Von Mueller, curator of the splendid botanical gardens at Melbourne, says that he has seen peppermint trees (*Eucalyptus piperita*) on the Dandenong range, Australia, 480 feet high—almost as high as St. Paul's Cathedral, London.

The Pennsylvania Railroad Company is making an effort to abolish the popular use of the word "depot." The word "station" is to be used on its lines henceforth, and even the great "Union Depot" at Pittsburgh is hereafter to be known as the "Union Station."

Switzerland has a new lake. A huge mass of rock and earth fell from a mountain side at Sennix in the Grisons, blocked up the course of the Jobel, an affluent of the Rhine, and converted the village into a lake. The village of Surrhein, hard by, is in great danger.

The *Springfield Republican* is responsible for the statement that there is a married couple in that city who have not spoken to each other for years, and are not dumb either. They are trying to see which will hold out the longest, and at present make their little son a medium of communication.

Last year's returns show that the number of persons killed throughout India by wild beasts or snakes has gradually increased from 19,273 in 1876, to 21,990 in 1880. The largest number of deaths occurred in Bengal, where 10,064 persons died from snake bites, and 359 were killed by tigers.

A veteran watchmaker at Vouvry, Switzerland, claims to have invented a process by which watches will run for years without winding up. A sealed box, containing two watches, intrusted to the municipal authorities on January 19, 1879, has just been opened, and the watches were found going.

Among the curious historical objects exhibited at the Venetian Geographical Congress this autumn, was the linen cap worn by Louis Manin, last Doge of Venice, on the last day of the republic. When he doffed it he gave it to his Chamberlain, with the words: "Take this, I shall require it no more."

The Zoological Garden, at Moscow, is said to be in possession of a horse without hair. It was sent from Turkestan by Gen. Kaufman. The color of the horse's skin is red, and his points are said to be admirable. He is, however, very sensitive to the cold, and has to be kept warm by thick woolen cloths.

In his work on worms, Mr. Darwin points out that Stonehenge has not been brought to its decadence by time alone. The earthworm has undermined it, stone by stone, and the very monolith lately propped up by Sir E. Antrobus has probably been put out of the perpendicular by the action of the worm.

In Norway, it is said, the erection of telegraph poles and wires scares all wolves away from the neighborhood, and many miles of line have been put up for the double purpose of securing rapid communication and immunity from the wolves. Large districts have thus been cleared of the dangerous and troublesome brutes.

There is treasure to dig for somewhere on Stone Mountain, in Arkansas. Ben Munell was a noted hermit. He lived thirty years all by himself, was a highly successful trapper, and is believed to have accumulated \$15,000 from the sale of skins. He has now been found dead in his hut, and his money is buried in some unknown spot near by.

In a primary school, not very long ago, the teacher undertook to convey to her pupils an idea of the use of the hyphen. She wrote on the blackboard "Bird's-nest," and pointing to the hyphen, asked the school: "What is that for?" After a short pause, a young son of the Emerald Isle piped out, "Plaze, ma'am, for the bird to roosht on!"

American beef is regarded in England as of a superior quality, but they think the mutton we send there is not to be compared in flavor or tenderness with that of home production. The reason for this is that our sheep are generally treated in a way to favor the growth of their fleece, without much consideration of the quality of the mutton.

At no period were the cathedrals and other great churches in England in such fine order as to-day. Forty years ago, a number of them were in a condition not many removes from ruinous. Since then millions have been ex-

pended on them. In some cases a canonry is permanently left unfilled, and the accruing income devoted to current repairs.

In the old Museum of Bale there is a cannon over three hundred years old, with a calibre of $13\frac{1}{2}$ inches, which has an interior closely resembling that of one of the modern systems for rifling ordnance. The nature of the bore is such that it is quite evident an attempt had been made to give increased effect to the shot by a rude species of rifling.

The sultan of Zanzibar is liberal where explorers are concerned. On Mr. Joseph Thomson, who is hunting the rivers of his dominions for gold, he has settled \$2,000 a year, while paying all the expenses of the expedition. Thomson is a raw young Scotchman, considerably under thirty, who only a few years ago was a student of geology in the University of Edinburgh.

There is in Roumelia a valley known as the Kezanlik, entirely given up to rose culture. During the flowering season it is from the top of the hills on either side one mass of flowers. So saturated is the air with the perfume that it clings to the hair and the clothes, and the scent remains for days on the latter. The essence sells wholesale in Paris at 1500 and 2,000 francs the kilo, and is retailed at 5,000 francs and over.

The printers of Leipsic have just celebrated the four hundredth anniversary of the introduction of printing into that town. In 1481 Andreas Preisner, a professor of theology, set up the first printing-press in Leipsic. He made a present of it to a monastery, on condition that the monks would pray for his soul. Now Leipsic has 82 printing establishments, with 451 steam presses and 971 hand presses, employing over 12,000 people.

One of the objects of the meeting between the Emperor of Austria and the King of Italy was the negotiation of an arrangement with the dispossessed Italian princes, whereby the latter may recover a portion of their confiscated estates. King Francis of Naples, and the Duke of Parma, went to Vienna to confer with King Humbert on the subject, and the Emperor Francis Joseph consented to assist in obtaining a final settlement of the claims.

The famous spring of boiling water in the middle basin of Hell's Half Acre, in the Yellowstone region, has lately become still more wonderful as a geyser. Four or five times every twenty-four hours it discharges a great column of water, freighted with stones and obscured by a dense volume of steam. The hollow formation for hundreds of yards around the orifice trembles under the upheaval, and

the water is thrown to a height of a hundred feet.

Among the first to formally approve and use the revised version of the New Testament were the Protestant clergymen of New Haven. A few days ago, in a meeting for discussing the subject, a majority announced a change of opinion, by voting that it was too faulty to be acceptable. The chief condemnation was of bad English, the Rev. Dr. John E. Todd declaring that he had counted 150 errors of grammar uncorrected in one of the epistles to the Corinthians alone.

Queen Victoria, on October 25, completed a reign of 44 years and 128 days, which is just the length of time that Queen Elizabeth sat on the throne, that Queen reigning from November 17, 1558, to March 24, 1603. Consequently she has reigned longer than any other English Queen Regnant, and longer than any English king, with the exception of George III., who reigned 60 years (1760-1820); Henry III., who reigned 56 years (1216-1272); and Edward III., 50 years (1327-1377).

Professor Bruniati, of the statistical archives of Rome, estimates that there are altogether in the world 6,568,000 Jews, of which number 5,500,000 are in Europe, 240,000 in Asia, 500,000 in Africa, 308,000 in America, and 20,000 in Australia. Taking the European countries, by far the largest number of Jews, in proportion to the population, are in Roumania, where the average is 7.44 per 100 inhabitants. Russia comes next with 3.57 per 100 inhabitants, while Germany has 1.22, Great Britain 2.20, and Portugal only 0.04.

The government of Jamaica are desirous of encouraging the planting of Peruvian cinchona trees in the island. The soil and climate are not less favorable than those in the East Indian plantations, in the Neilgherry hills, whence so large and valuable a quantity of bark and quinine is now annually obtained. With this view the government announce that they will grant lands at a nominal price to any persons who may be prepared to embark in such an undertaking, on terms calculated to insure that the allotments shall be used for this purpose only.

A Mr. Hargrave calls the attention of the London *Times* to the following case of the resurrection of a tree. A few years back a great elm was blown down, with a large ball of earth at its roots, on the property of Mr. Smyth, the rector of Little Houghton. Men were set to work to remove it, but when they had sawn off the great limbs, to their astonishment, and almost terror, the trunk

rose up of its own accord, and went back to its original place, and there stands to this day. It is throwing out a fresh head, and is pointed out as a curious case of resurrection.

Farnborough Hall, the new home of the Empress Eugenie, stands in grounds of 260 acres, well timbered, with splendid gardens, and amid a charming homelike country. The estate was bought for her for £50,000, although it is said that the mansion alone could not have been built for much less than £90,000. Alterations are being made which were originally estimated to cost £17,000, but it is probable that nearly three times that sum will be expended. The property formerly belonged to the late Mr. Longman, the publisher, who had made it very beautiful.

Signor C. Desimoni of Genoa has just published a monograph upon John Cabot (father of Sebastian Cabot), the discoverer of Labrador and Cape Breton Island prior to Columbus. He examines carefully all the authorities relating to the subject, and prints for the first time in one collection all the known official documents, notices in accounts, passages in contemporary chronicles, or correspondence in any way bearing upon John Cabot and his discoveries. Some of these, drawn from Spanish and English sources, are new. The author adduces the conclusions of Mr. Henry Harris, an American in Paris, who is at work upon a new publication on Columbus, to support his own that the continent of America was discovered by Cabot in 1497, at least a year before Columbus found terra firma.

The colony of the Australian group which has the most land under cultivation is South Australia, with 2,574,489 acres, most of it under wheat. Nevertheless, though the wheat acreage is double that of Victoria, the produce is less. Victoria stands first in population, and, except New Zealand, has the largest public debt. It is first in exports and imports, and has more railroads opened than any other colony save New Zealand. The public debt of Victoria per head is £25 16s. 9d., and, reckoning the interest on this at $4\frac{1}{2}$ per cent., the annual interest charge on the whole British debt, including sinking funds, is not more than 16s. per head.

Professor Campbell, of the Presbyterian College, Montreal, believes that he has found the key to the Hittite inscriptions, and has sent the results of his investigations to the Society of Biblical Archaeology. The most striking and important feature of this work is the identity established by Professor Campbell, as he believes, between the Aztecs and the Hittites.

He concludes with a statement of his discovery in *The Montreal Witness*, as follows: "It is interesting to know that we have on this continent the remains of a people who played a great part in ancient history. It is also gratifying to learn that by the establishment of the Hittite origin of the Aztecs, evolutionism in philology and ethnology will receive its death-blow."

In France a pearl costing sixteen dollars is now imitated for fifty cents or a dollar, and so successfully as to be sold at the price of the genuine article to any one not a veritable expert, and even the latter class are often puzzled. The artificial pearl, however, is simply a glass bead or globe, which is first coated on the inside with a glue made of parchment, then treated with a peculiar so-called "essence," after which it is filled with wax. The essence is the chief pearly ingredient, and is obtained by rubbing together white fish, so as to remove the scales; the whole is then strained through linen and left to deposit its sediment, which is the essence in question. It requires about 17,000 fish to produce a pound of the pearly essence.

Mr. Charles Darwin's most recent book treats of the formation of vegetable mould through the action of worms. "We have seen," he says, discussing their mental qualities, "that worms are timid. It may be doubted whether they suffer as much pain when injured as they seem to express by their contortions. Judging by their eagerness for certain kinds of food, they must enjoy the pleasure of eating. Their sexual passion is strong enough to overcome for a time their dread of light. They perhaps have a trace of social feeling, for they are not disturbed by crawling over each other's bodies." The intelligence of worms has been made the subject of prolonged and profound study by Mr. Darwin. The great philosopher has occupied whole days and nights in observing "mere worms," which to non-naturalists are regarded as supremely unimportant.

The Rev. O. B. Frothingham, who is now living in Boston, explains that he is no more a believer in Christianity than he was ten years ago; yet he is not so firm a disbeliever. "I have doubts which I had not then," he writes to the *Boston Journal*. "The creeds of to-day do not seem in my eyes to be so wholly groundless as they were then, and, while I believe that the next hundred years will see great changes in them, I do not think that they are destined to disappear. To sum up the whole matter, the work which I have been doing appears to lead to nothing, and may have been grounded upon mistaken premises. Therefore it is better to

stop. But I do not want to give the impression that I recant anything. I simply stop denying, and wait for more light."

OUR GOLD AND SILVER YIELD.—The director of the mint gives the following statistics: During the past year the mines of the United States have yielded a total of \$75,000,000, against \$80,000,000 in 1879. Colorado is now the banner State, as it yielded last year \$20,000,000, of which \$17,000,000 is silver. California is next, with \$18,000,000 to her credit, \$17,000,000 of which is gold. Nevada is next, with \$16,000,000, of which \$5,000,000 is gold. California gave \$20,000,000 in 1879, and Nevada \$22,000,000 the same year. Both States have fallen off, while Colorado has leaped ahead. The remainder of our supply of precious metal comes from: Arizona, \$2,400,000; Utah, \$5,000,000; New Mexico, \$550,000; and the remainder from Oregon, Montana, Dakota, the Southern States, &c. The single county of Lake, Colorado, in which Leadville is situated, gives more than half the yield of the entire State, or \$12,000,000; while \$6,500,000 were produced by the famous Comstock lode of Nevada.

Kairouan, the holy city of Tunis, which the French recently occupied, has its ramparts concealed by Indian fig trees, which are enormously large. A long corridor gives access to a second enclosure. All is silent in the city, and nothing is heard but the murmur of prayers and the melancholy voices of the muezzins on their minarets. In the middle of the town is erected the large mosque of Djama-el-Keber, in the form of a fortress. It was Mohammed's barber who sanctified the place, and his remains repose within the mosque, together with several hairs of the prophet's beard, venerable relics for the Mussulmans. This African Mecca has never borne a foreign yoke, except for thirty years. It was taken by Roger of Sicily, whose helmet and crossbow are kept hung up in a chapel of the Djama-el-Keber. Kairouan was the seat of learning, and in its mosques, which contain many manuscripts, the Ulemas studied their doctrines. The French will search among the libraries for Greek and Latin works of antiquity.

OUR RAILROADS IN THE FUTURE.—When the Massachusetts Central Railroad is completed, that Commonwealth will have more miles of railroad in proportion to its area than any other State or country in the world. With a territory of only 7,800 square miles, it will have a railway mileage of more than 1,950 miles, or one linear mile to each four square miles of area. The States and countries which, on the 1st of January, 1881, had the greatest railway mileage in proportion to their area, were:—

	Area.	Miles R'road.	1 mile to sq. mile.
1. Massachusetts.....	7,800	1,803	4.12
2. Belgium.....	11,373	2,672	4.26
3. England and Wales, 58,320		12,547	4.64
4. New Jersey.....	8,320	1,701	4.89
5. Connecticut.....	4,750	954	4.98
6. Rhode Island.....	1,306	210	6.21
7. Ohio.....	39,964	5,912	6.75
8. Illinois.....	55,414	7,955	6.96
9. Pennsylvania.....	46,000	6,243	7.36
10. Delaware.....	2,120	280	7.57
11. Indiana.....	33,809	4,454	7.59
12. New Hampshire...	9,280	1,015	9.14
13. Switzerland.....	15,233	1,598	9.53
14. New York.....	57,000	6,019	9.80

The *Journal des Debats* quotes from a Mexican paper a statement to the effect that Don Carlos, since his expulsion from France, has commissioned two distinguished and influential Mexican gentlemen to inquire whether their government would object to his taking up his residence in the Mexican capital. The reply, according to this authority, was that their visitor would be welcome on condition that he did not conspire against the tranquility of the republic. The writer adds, that he believes himself to be in a position to announce that Don Carlos will ere long establish himself in Mexico with the Princess Margaret and their children.

The traveling company now appearing in a translation of the French melodrama, "The Legion of Honor," is soon to appear in the Passion Play. The leading actor of the organization is James O'Neil, who enacted *Jesus Christ* in the San Francisco performances last year, and was to have taken the same part in the abandoned New York venture. Lewis Morrison will be the *Pontius Pilate*, S. Piercy the *King Herod*, and J. W. Wessells (who was the Italian assassin in "Forget Me Not," at the Union Square Theater,) will play *Judas Iscariot*. The *Virgin Mary*, according to the manner, will be "a young society lady of the city in which the play is to be produced, and she has been under special instructions for months." It is understood that the city is Chicago.

Mr. Iungerich, a wealthy gentleman of Philadelphia, recently procured the publication of a large edition of *The True Christian Religion*, an octavo volume of about 600 pages, and offered it free of charge to any clergyman who would send the postage, 30 cents. More than 20,000 ministers of the various denominations up to the present time have taken advantage of this liberal offer, and have sent for the book to the publishers, J. B. Lippincott & Co., of that city. Mr. Iungerich has thus set an example worthy of imitation, as no better use can be made of money by the wealthy who have about reached their span of life than in the free distribution of useful books that will live and be

doing their work of beneficence long years, and perhaps centuries, after the donors have passed away. Mr. Ingerich's name stands in red letters, inscribed on the title-page of each copy thus given away.

The original half million sterling given by Mr. George Peabody for the erection of model lodging buildings in London, has now become £720,000. This large increase in the capital of the trustees is stated by their surveyor to be due to the income from the buildings. The occupants of rooms are stated to include all grades of the working classes, from the laborer and washerwoman to the skilled artisan. The entire expenses of the management of the trust are, according to the same authority, under £800 per annum. The deaths in the Peabody Buildings calculated upon sixteen years' experience, has been at the rate of only sixteen and seven tenths per thousand per annum, while the general death rate for the metropolis during the same period has been twenty-three and four tenths. The death rate in crowded districts surrounding the buildings may be taken at thirty or forty to the thousand.

A new cure for the tobacco-habit has been discovered by an old man in Connecticut, by the name of Todd. He is over eighty years of age, and has been an inveterate consumer of tobacco nearly all his life. He made the discovery that a quid of spent tea-grounds, with a sprinkling of tobacco mixed, proves an excellent "dummy" for misleading the vitiated appetite. The quantity of tobacco thus mixed with the tea-grounds is then diminished, day by day, till it is finally and easily dispensed with altogether. These grounds are also dried and smoked with a mixture of tobacco in the same manner. The old man in this way has completely cured himself of the habit both of smoking and chewing, thus setting a noble example for the young men of America. Should this discovery start a reformation that will sweep the abominable weed out of existence, which it surely ought to do, the discoverer will be entitled to a monument more enduring than marble or granite.

Some recent experiments by Herr Stebler show that the views held by some botanists that light has no direct effect on germination, must be modified. He finds that the germination of certain agricultural grasses, such as meadow grass, is much more favored by light than heat. An experiment made with two groups, of 400 seeds each, showed that there germinated 62 per cent. in light, and 3 per cent. in darkness. Similar results were made with some other grass, showing 59 per cent. germinating in light, and 7 per cent. in dark-

ness. Sunlight being a very variable force, experiments were further made with gaslight, and with the same result, namely, that light favors the germination of certain seeds, especially grass, and that these germinate either not at all, or very scantily, in darkness. The fact was verified by Herr Stebler in a whole series of seeds. In the case of seeds that germinated quickly and early, such as clover, beans, or peas, Herr Stebler thinks that light is probably not advantageous.

The old home of Emanuel Swedenborg, says a Stockholm correspondent, is of great interest to American travelers. With scarcely a follower or believer in all Sweden—a prophet without honor in his own country—here he was looked upon, as I learned, to my great surprise, as a half-insane charlatan, and hence it is not to be wondered at that this is a neglected, dirty spot, whose associations its nearest neighbors know little or nothing about. The house in which he lived is occupied by tenants of the poorer classes of people. What is called his "study," is a small wooden house in the garden, and this is unoccupied and entirely empty, though kept tolerably clean swept. One is fortunate if, after a dozen inquiries in the immediate neighborhood, he finds any one to conduct or direct him to the spot. The garden is a kind of back yard partitioned off from a common court, surrounded by a block of buildings; and it is only accessible through one of these houses. The front of this little garden house presents a door two or three steps from the ground, and a small window, with outside wooden shutters, on either side of the door. A low attic room—under the slanting roof is shown as the place where, in his inspired moods, he often passed the night. The doorway is shaded by trees, one of which is said to have been planted by his own hand. Every visitor is allowed to break or cut off a memento from a beam inside the house, and to carry away as many leaves from the tree as he chooses. Nature sends a fresh supply of leaves every year, and new beams as often as they are needed. It seems to me that some of Swedenborg's wealthy followers in our own country might well do something toward the preservation and cleanly maintenance of this spot, which should be almost sacred to them.

THE IMMORTALITY OF THE SOUL.

BY REV. E. H. VAUGHN, B. D., PH.D.

PAPER II.

WE do not positively know that there is a life after this, or that man will continue to live

after the death of the body, yet we have the strongest possible reasons for believing it.

But there are persons who profess to be Materialists, and who believe that death terminates our existence.

There are also those who believe that death is the end of the wicked. They believe that when the trumpet of God shall sound the resurrection signal, the righteous will come forth in the strength and vigor of eternal life, and the wicked be permitted to sleep on forever in the tranquility of endless oblivion, or be punished for a while, and then blotted out of existence.

There is also the Christian theory that man is a spirit, and that he will be co-existent and co-eternal with the Father of Spirits; and that when this life ends he will step out into another and invisible realm, and continue consciously to exist after death.

This is the view we hold, not only on biblical grounds, but also from philosophical reasoning. If we were governed simply by the senses, without the aid of reason and revelation, we too would say death is the end of man; but the witnesses testify differently.

We follow the body of man to the tomb, deposit it in the grave, and it returns to dust. Beyond this we cannot follow him; he vanishes from our sight, and never returns. An endless oblivion covers the abyss of the grave, and by a knowledge of the senses we cannot say there is any further conscious existence.

But there are two sources from which we learn that death is not man's final extinction, and that when his house of clay crumbles down, he moves out to dwell in another temple, of superior beauty and more excellent grandeur. Reason and revelation speak alike on this point.

The evidence of the senses is that death is the end of man, because we see no more of him; but the evidence of reason is that what we see is not the man, but only the house in which he lives: and that when the house crumbles down, the man moves out, but continues to live.

As man differs from the house in which he lives, so does the spiritual man differ from the physical.

Man, then, is a duplex being,—physical and spiritual. One part is material, and subject to decay: the other is spiritual, and destined to live forever. We will see which element in his nature was prior and essential to the other; and hence, which may exist when the other is gone,

Spirit is a factor in thought, which lies behind all material organism, and is necessary thereto. We illustrate this truth with the watch: and without the aid of reason we can

not tell how or from whence it came. But reason affirms that it did not come by chance, and that there was a thinker behind its organized machinery who thought out its different parts, connected them together, and made the watch in thought, before it ever existed in reality. Then we affirm that the existence of the watch depends on the thought-factor which lies behind it, and which existed prior to and apart from it.

And what is true in this case is true in every case of organic (made of parts) existence. That thought lies behind organism is a necessary and an eternal law; and science proves that every atom in the universe, both in dead and living matter, is a complete organism.

As behind the works of human art we find a thinker, so here we find a mind who first thought out these forms, and then made them real.

Reason leads us out through the universe, where we find an organism more complete than that of the watch. Its wheels are the invisible and intangible circles made by the suns and the systems as they pursue each other through space. This system of things had a beginning, and that beginning postulates a thinker behind it who thought out and created all this machinery and put it in motion.

To prove that it had a beginning, we turn aside for a moment: because there are many who say it had no beginning, but was eternal. This can not be, for succession postulates a beginning. If the present system of things be eternal, then were day and night eternal; and if so, neither could have existed before the other, for the day preceded the night, then the night was not eternal, and the reverse is true. And so in all the universe, it is a complete system of succession, one thing following another; and no succession can be eternal, for one thing is preceded by another, and that which comes second in the series is not eternal, because something was before it. Hence the universe itself was not eternal, but had a beginning, and a thinker behind it.

Again, science proves that the forces in Nature are being exhausted, and that the universe is coming to an end. An end postulates a beginning, and that beginning postulates a thinker behind it. If it had existed from eternity, then the process which is bringing it to an end would have been completed, and the end reached many ages ago.

Spirit is a factor in thought: and behind all this machinery of the universe is that thought-factor which was necessary to form these wheels and set them in motion.

Then this doctrine of spiritual existence is not assumption. It is not all a dream; for we

are compelled to find it in that law that lies behind all things.

We now have One eternal, and that One is spirit—the designer and thought-factor behind the universe is spirit and eternal, so is it behind the watch. As a drop of water compared with the ocean, they differ not in essence, but in quantity.

The real man is invisible and imperishable, like God, his Father, the body being only a garment with which he is clothed. He was a foolish old philosopher who went through the streets of Athens at midday with a lighted candle to search for a man; for man is invisible, and can not be seen by candlelight, because spirit is not visible to an eye of flesh.

Science teaches that the body is changing and passing away, and that a new body takes the place of the old one every seven years. Then the man who is seventy years old has had ten bodies; and yet the real man remains unchanged, for the soul is not a material structure, subject to the mutations of time, and man is not a physical but a spiritual being, and the spiritual reigns over the physical and survives it.

Then, since man is a spirit and not a body, the body may be destroyed without injuring the man. To take apart the wires of the cage does not hurt the bird, but only liberates it from prison, so when the body is taken down the man escapes from his prison-house unharmed.

The organist exists separate and apart from the organ, and the organ may be destroyed, and thus it becomes impossible for him to evolve music which will be audible to the natural ear; but that does not hurt him nor destroy the music in his soul.

So when death destroys this organ of flesh and blood, it does not injure him who lives behind it. He may wear Gige's ring, and hence be invisible to an eye of flesh, but his existence is potent and real still.

Then if death does not destroy the man, what does or can? For we have a duplex being, physical and spiritual; and over the spiritual death has no power. We belong to two worlds, and may almost close in ourselves from the outward world, and live alone in the spirit-realm, where all is eternal beauty, where God is, where souls and angels live, we may hear the chimes of celestial music, and feel the gravity that draws us heavenward.

We may then live a life the best of all, without this body.—a glorious one, and forever. This may be thought a strong inference, but we will see if it be not legitimate.

No finite being has power to destroy itself or another. Every being whom God has caused

to exist has a right to life, and will live forever, unless by a destructive fiat of almighty power God bids it cease to be. This he will not do; and we believe he can not, for spirit is of the same essence with his own nature, and hence is indestructible.

The spirit that dwells within is the real man, while the body is only the house in which he lives. In man, then, is the boundary-line between two worlds. One side of him belongs to the sensible, and the other to the super-sensible realm.

We have an illustration in the art of telegraphy; and we will see how a telegraphic wire reaches out into the spirit world. Electricity is the finest form of matter; and is as near to spirit as we can get, in this material world. It, too, is the boundary-line between two hemispheres—the physical and the spiritual,—and partakes somewhat of the nature of both. It is imprisoned in the galvanic battery, and bears some analogy to the spirit-man imprisoned in the house of clay.

There is a wire extending to Europe, and at the end of it sits a man, while within him is the real man of thought and spirit, who wishes to converse with his friend at the other end of the line. Electricity is his agent, and he saddles his thought on this invisible courser, which carries it across continents and under seas, and deposits it the same moment with the invisible personality of the man of thought and spirit at the other end of the line.

The thought which exists in the invisible personality of one man is carried by this invisible agent and deposited the same moment with the personality of his invisible friend in another clime. The thinker and the thought are as real as the wire and the electricity, yet invisible and immaterial. We know the existence of the one by the observation of the senses, and of the other by the laws of thought revealed to consciousness. The natural man arrives at a fixed standard, then goes backward in the scale of being and dies; but not so with this real man of thought and spirit, for there is no limit and no end to his powers. He masters one thing and then passes on to another with increased capacity, like the schoolboy whose acquirements increase his capabilities. He may put himself into communion with God, drink in the thoughts of the eternal mind, and continue to ascend the magnificent highway stretching from the cradle to eternity, from earth to the throne of God,—widening in his facilities and increasing forever in his capabilities for receiving love and truth.

God has placed within this man of thought and spirit the possibilities of eternal growth; and by this He means that he shall grow for-

ever, for He does no superfluous work and creates no capacities without a purpose, but it doth not appear what we shall be.

Man has a desire to live forever, and this desire is God's promise of an eternal existence. It is written by His own hand on the tablet of the soul, and is a sublime, undefined and irrepressible outreaching of soul (or *spirit*) after an eternal existence which rises up before our faith in vast and majestic splendor. God has implanted this desire in every soul (or *spirit*), and it is a divine testimony He will not mock.

When the instinct of the bird prompts it to fly southward it has a right to infer that there is a south to match its migrating instinct; for God does not give it this instinct to mock it, neither will he mock us in our aspirations and instinctive outreachings of thought and soul after an eternal existence, for He leaves no unmatched half-hinges in our nature.

If we be not immortal, then is God's mercy not vindicated in creating us with these desires and possibilities for which there is no satisfaction. His law declares that the wicked shall be punished and the righteous rewarded. It is not done in this life; and the illustration is broad as the world and long as the ages. Then for man there must be a future where the inequalities of the present life will be rectified and adjusted.

PROOF AND REPROOF.

BY PROF. J. SALLYARDS, A. M.

MANY subjects of scientific investigation can not easily lend themselves to the list of observation or experiment. A good illustration may be found in the vast body of geometry, ancient and modern. The patient inquisitor must take his departure from simple axiom and definition, cautiously direct his steps from proposition to proposition, exceedingly elementary and primitive. He advances onward, infallibly securing his position at every step, till he can encounter propositions of considerable complexity. He carefully unfolds the synthesis, spreads out the elements around him, and everything is in harmony with axiom and definition. Then he steps boldly forward to spheres and spheroids, to paraboloids and solids of revolution. He ascertains deductively the laws of their generation, and forms easy and comprehensive rules for their computation. His rules prove to be absolutely true. Had he attempted to find or establish these laws, or rules, by trial or experiment, like the little child at play, he would have built, prostrated, and rebuilt his mansion a thousand times in vain. But by the same process of systematic

deduction the geometer proceeds onward; he computes the segments of circles, extends them to the skies, and calculates the distances of suns and worlds.

Now he idolizes his wonderful achievement. He believes he possesses the instrument and the method which will always lead him unerringly from the known to the unknown. He describes from deductive reflection on what may be, what ought to be, some unknown plant or animal, and renders himself ridiculous, as was the case with Aristotle and some of the ancient philosophers.

Owing partly to these manifest blunders, and partly to the influence of the *Novum Organum* of Lord Bacon, the order of thought in modern times was completely reversed, and sent more in pursuit of knowledge by observation and experiment. So gigantic have been the advances of men in all the physical sciences by the adoption of this new method; so astonishing the number of mechanical inventions, and the application of the forces of Nature, down to electric and magnetic agencies, that men, in these recent times, have begun to idolize the omnipotence of *induction* and experiment, and speak with contempt of the old deductive method. Observation and experiment reveal everything now-a-days; and wherever these do not reveal anything, we may be sure there is nothing there. The supernatural is a dream of old men in their dotage, because no instrument of the laboratory will detect it. Just the same with the will, with the consciousness, and the connection of consciousness with material organs. Everything which really does exist must be brought within the domain of our *five* senses,—within the autocracy of our magnetic batteries. Whatever refuses the dominion of chemical or electric supremacy must be relegated to the fairy realm of fancy and imagination. It has even descended into our system of education. The little boy must now have a horn-book full of pins and needles,—something to be seen,—while the adult student at college must have his skeleton models, before he can understand such antiquated forms as cones and pyramids. Even spirits in this wonderful age are materialized, and rap on tables and doors,—while they can not be persuaded to leave their Summer Land without a regular seance and a laboratory of apparatus.

One has become so enamored with matter as to believe that the universe is eternal, that no intelligence was necessary to harmonize the chaotic masses into *order* and due subordination, even down to the genera and species of animals. He has overlooked, or forgotten, or ignored, the necessity of logical antecedents; that a house necessarily presupposes space to

contain it; that order, harmonious arrangement, classification, graduation in regular succession, necessarily presupposes Mind, Intelligence; and if he insist that this Intelligence postulates another Intelligence behind it, and so on, he forgets that the space presupposed in house does *not presuppose* another space as logically antecedent to it. He forgets that these logical antecedents are not attained by inference or deductions of reason, but accompany their several ideas simultaneously, like colors in the rainbow, or the tonic—twelfth and seventeenth in music.

In very truth, neither of the two methods of investigation should be idolized, — neither should be neglected to the disparagement of the other. Sometimes the one will apply best to the object of research, sometimes the other; sometimes both will mutually enhance their efficiency. If intellects of such gigantic powers as we have had and have in recent times would unite their powers under the guidance of the ancient and modern philosophers in the spirit of such men as Sir William Thompson, Professors Tait and Balfour Stewart, worlds of the supersensible would be revealed, the reality of some invisible ether be established, its nature explained, and the mysteries of life, of consciousness, of thought and feeling be rendered more accessible to common apprehensions. You would find that the great blunder of applying the law of gravitation to light and the motion of sound, the diminution of intensity in proportion directly to the square of the distance, would be corrected and their own laws finally determined.

It is surely matter of profound astonishment that one man of pre-eminent learning and ability should assert without the possibility of proof: "I find in matter the potency and promise of all terrestrial life;" that another, of great forensic eloquence, should deny that in this vast cosmos of permanent *uniformities*, principles of continuity, and inconceivable velocities, any objective law is to be found; that all laws of attraction, evolution, gravitation, &c., are merely the products of our own minds. We make the laws, and foolishly think we have found them! And for what purpose all these wild assumptions, these delusory misconceptions? All to escape the idea of a Living Intelligence! To banish God from the universe, to make this cosmical infinitude a splendid self-acting apparatus,—a heartless, fiery engine, without an engineer, careering through space at the rate of 66,000 miles an hour; and we trembling intelligences, having no choice either to get on or off, for there are no station-houses, no restaurants, and, half frightened to death, we are obliged to travel 570,000,

000 miles every-year, with nothing to appeal to, nothing to pray to but ten thousand other engines whirling and blazing around us! Oh, Death! Merciful Death, snatch us from this unpitiful machine!

LECTURE ON EVOLUTION.

BY GEO. H. MCKNIGHT, D.D.

Ladies and Gentlemen: I appear before you this evening as the advocate of a science which has within the last few years moved the intelligent mind, both in Europe and this country. The subject itself is confessedly a most important one, for it involves the origin of the world, if not the universe, and not simply matter, but all forms of life. Now, in stating the question, I suppose, first of all, it will be generally admitted that there are but two ways open for investigation on this point. One by what is termed revelation, the other by purely scientific examination and deduction. We scientists, of course, only recognize the latter. We do not, indeed, wish to disparage Moses as a writer in a dark and superstitious age. Considering, indeed, the time in which he wrote, and contrasting his production with contemporary writers, it certainly must be regarded as highly respectable. But Moses did not live in the nineteenth century; Moses was not born in Boston; Moses did not belong to our set. In fact, it is by no means certain that he is at all related to the Anglo-Saxon race. As scientists, therefore, though having a personal regard for him, yet we reject him as authority. His account of creation is well written, but it is unscientific; and we claim that the subject is purely one of science, and science demonstrates evolution, and that evolution is in accordance with immutable natural laws. We discard, therefore, all miracles in creation, and all supernatural agency and take our stand upon law.

In regard to the material earth itself we hold what has been designated as the Nebular hypothesis. Far back in the dim and distant past, beyond almost the stretch of imagination, not only millions, but hundreds of millions, and possibly billions of years, there existed a vaporous substance, gaseous and fiery, which gradually cooled, and assumed, according to law, form and motion. Here, then, in the beginning, we have matter and force, the two great factors of evolution. Now, after a period, millions of years perhaps, more or less, life is evolved, or spontaneous generation occurs, a pulpy or gelatinous mass is produced, involving germ-cells and bioplastic forms of being. Another period passes, a million or a

hundred millions of years, more or less, as the case may demand, and we have the mollusk, or protoplasmic form,—a product which involves and contains all species and varieties of being, from the lowest up to the highest, from the germ-cell, through manifold ages, up to man. Here, then, you behold without miracle or revelation, or any supernatural intervention whatever, the whole problem of creation solved ; or, in other words, the chasm between nothing and something, or between matter and life, bridged over ; or, if you please, we might put the case in a mathematical form. This, perhaps, will be more satisfactory to some, as no science is so exact as mathematics. Let, then, for example, X represent an unknown quantity, say matter ; then X plus Y , force ; X plus $Y Z$, organic life ; X plus $Y Z W$, man, —minus woman. The *double you* is here significant, for woman, being embodied in man, will, in the course of time, by a law of variety, be developed from man, and being so developed, will, in the nature of the case, be of a more refined nature, no matter whether she came from a rib or a muscle. So we see that the transition from lower to higher types of being is comparatively easy. By a law as fixed and as irrevocable as that of gravitation, the organic succeeds the inorganic ; the vertebrate the invertebrate ; the articulate the inarticulate ; and man, the highest brute type, and woman-man, with her peculiar physical organization, which constitutes the difference in sex, the result. And when this is accomplished, then the reproduction of species goes on by those laws of natural generation which we see everywhere preserved. We have supposed, of course, the male only first produced. But we have shown by a mathematical demonstration that woman was embodied in the man ; and certainly, after a million of years, or a hundred millions, more or less, we may reasonably suppose a variety of organs and nature adapting her to circumstances, so that the male sex is differentiated into the female. By this process, too, of development, we behold a variety of species produced, and organic perfection attained. That which was crude or rudimentary assumes symmetry and beauty. Internal organs, the liver, heart, lungs and brain, assume perfect shape, and work in harmony. The limbs are also properly articulated ; the eyes enlarge and assume intelligent expression ; and other features—the nose, mouth, and chin,—become distinct ; and especially prominent in the monkey species, more and more improved, until in the chimpanzee, gorilla, and anthropomorphous ape are reached the highest order of the quadrumanous mammal. And here we observe, with the greatest pleasure, a strong

resemblance to man himself. The upright position is, in a measure, assumed, the fore legs become fore arms, and claws are developed into hands, the tail is perceptibly shortened, and, in some cases, disappears altogether. The frontal portion of the head becomes bald, and the brain is enlarged. The perceptive organs are prominent : individuality, size, weight, color, &c., are well developed, and causality and comparison of the reflective are not wanting. Something, too, like language is approached ; and a dialect is evidently understood among themselves, which may be evolved in time—a million years, perhaps—so as to approximate human language ; or, at all events, will be more satisfactory to them. But whatever may be said on this point, there are facts well authenticated by scientific men, which show a very close resemblance between the guttural sounds of the gorilla and ape and the deep-toned grunts of the North American Indian, and demonstrate that their cries of distress are far superior to those of the jackal or hyena. I am aware, indeed, that some naturalists who are skeptical as to our theory, claim that animals of a lower type outrank them in this respect, and that for pathos and sentiment no cries equal those of the common housecat, or approach so near the human, and we are free to admit that in the silence of the night we have been at times exceedingly impressed by their notes of woe, yet not sufficiently to shake our faith in the fixed laws of progression which the science of evolution requires. But even here we have an incidental proof of our theory. For who shall say that in the past these plaintive strains of the cat have not foreshadowed the wonderful musical power of the intestines of this animal ? foreshadowed the time when from a catgut the highest harmonies and sweetest melodies would be evolved, and an instrument be produced which would not only challenge the attention, but develop the genius of a Paganini and an Ole Bull ? In itself a catgut is a very simple thing,—nay, to the vulgar eye it may seem a vile thing. But in its evolutions how wonderful ? And when you consider the vast difference between its silent slumber, if I may so speak, in the body of a cat, and its marvelous tones under the hand of a master, can you doubt that all the deductions of evolution are true ? In view, indeed, of such facts, can there be any limit to our deductions or conclusions in this department of science ? But while I would in no case disparage the cat, yet there are anatomical and physiological reasons for placing the monkey on a higher level in his relation to man, and for believing that when we come to the highest development of his species that we are within

a step of man himself, and with all his wondrous powers of body and mind. And here let us pause a moment and observe our progress, which may be illustrated by a ladder whose rounds would represent the various stages or epochs through which we have passed. At the bottom is the bioplast, or gelatinous matter, or monad. A step higher, and we have protoplasm, or organized form. Another step, invertebrate, then mammalia, then varieties by natural selection, then superiority by the survival of the fittest; and this brings us to the anthropomorphous ape, and then to man, the crowning development of all. Or we might illustrate it by a pyramid reversed. This, however, might make the theory a little top-heavy; and hence, as an illustration, we might prefer the ladder. Now, at this stage of the argument, while as scientists we admit that the doctrine of evolution is in some degree hypothetical, yet we must insist that the order of progression and succession is demonstrated; and though there are difficulties in regard to some of the inferences, which we propose to consider, yet we have good hope that in time they will disappear. The time may be long, possibly a million or a hundred million of years, and yet this is of little account when you consider how vast the interval from the beginning until now. It is true, indeed, that this development of the monkey species into the human, is not flattering to our vanity. It does not suggest any attractive coat of arms as far as our ancestry is concerned. But the deductions of science can not yield to human pride. It is not necessary, however, to go back to a remote antiquity for heraldic devices. In fact, there are few who can go back for more than two or three generations without stumbling upon a blacksmith or cobbler as their progenitor, which reminds us of the witticism of Theodore Parker, who, on a certain occasion, said "that many who in these days are seeking for coats of arms, find that their ancestors had no coats to their arms." But whatever may be said on this point, we must adhere to the rigid exactions of science. As candid investigators, however, we are bound to look difficulties fairly in the face.

And first of all, we must frankly admit that the origin of matter, and the physical basis of life, are somewhat perplexing. We are here puzzled to say precisely upon what the ladder rests. "Ex nihilo nihil fit," is an ancient maxim from which we would not rashly dissent. To the common mind it seems as if there must be something antecedent to law, some primal cause, that it is difficult to conceive that matter or spirit could originate itself. And even the cultivated and scientific mind

finds it hard to grasp this. But if it did not originate itself, then it must be self-existent, and then it seems to become the "unknowable" of Spencer's philosophy, or the "Great Universum" of Strauss. But who and what is this great Universum? Is this another name for God, and does science then lead to a personal Deity or Creator? These are startling questions, and scientists must be careful lest they admit too much, and thus compromise their theory of the universal reign of law. At the same time, however, we must concede the difficulty here for the present. This Mr. Huxley himself does, when he says, in the following words: "For, after all, what do we know of this terrible *matter*, except as a name for the unknown hypothetical cause of states of our own consciousness? And what of *spirit*, over whose threatened extinction by matter a great lamentation is arising, like that which was heard at the death of Pau, except that it is also a name for an unknown hypothetical cause or condition, or state of consciousness? In other words, matter and spirit are but names for imaginary substrata of groups of natural phenomena." These conclusions of Mr. Huxley's would seem to leave the question of cause, both with regard to matter and life, somewhat in doubt. So much so, at least, that we should not feel at liberty to dogmatize at present as to either. So, too, when we look at historical facts or discoveries, though we have firm convictions, yet there may be room for doubt. We claim, indeed, beyond reasonable contradiction, that remains of pre-historic man have been discovered, and the vast antiquity of the race demonstrated. Human remains have been found, in the north of France, which identify man with extinct animals,—animals of colossal size,—the mastodon and megatherium, probably; and strong hopes were entertained a few years since by men of science that the Cardiff giant belonged to the colossal period. For a time great light was expected from this discovery; and it was with deep regret that suspicions of fraud were aroused, and we were compelled to abandon so choice a subject. It would certainly have been a great triumph to science, if a fossilized man could have been found, whose immense proportions would identify him with the mastodon species, or, rather, with his age. Thus far, however, in the remains well authenticated as belonging to the eocene period, or cretaceous epoch, we have not yet discovered the connecting link. On the contrary, the human skull is essentially the same; and, as an eminent writer observes, might indicate either the intellect of a savage or a Bacon. This is unfortunate, because on our theory there must have been a transition

from the ape to man, an intermediate being, a being neither altogether man nor animal, a composit creature, if I may so speak, neither man nor beast, and certainly not devil. But we must wait in patience. At present we must concede that so far back as we can go, the types of the monkey and the man are the same after their kind. The nearest approach, perhaps, to this being is the Satyr,—a composit creature of man and goat. Some pronounce the word *Satire*. I hope, however, that no one will suppose, in alluding to this, that any insinuation is intended as bearing on this lecture. I would by no means trifle with so grave a subject. The Satyr would be very valuable, if we could rely upon his authenticity. But there are well-grounded suspicions of his reality; in fact, the best authorities pronounce this being fabulous.

There is, however, I am happy to say, a better prospect of success in this direction, so far as the mere animal is concerned. For the four-toed horse of Mr. Huxley plainly indicates transition from the lower to the higher,—the evolution from claws to toes, and from toes to hoofs. The progression here may not, indeed, be clear to an unscientific mind; and there may be difficulty in showing that the hoof is an improvement upon the four or five-toed foot: and some have irreverently said that the theory of development, or progress, seems at times like a cow's tail, downward. But this is a superficial or external view only of the case. I admit indeed that for the human species the toes are an improvement upon the hoof, and a cloven hoof here would suggest unpleasant reflections. But in view of the manifest destiny of the horse the whole *status* of the case is changed. When you bear in mind that the horse is destined to travel upon hard roads, upon stone pavements, and often upon coarse gravel, you can hardly understand the vast improvement of the hoof over the toes; the toes, in fact, on some roads and at some seasons of the year, would be so encumbered with gravel and dirt as to render locomotion exceedingly difficult, if not impossible. I think, therefore, that Mr. Huxley is justified in the position taken; and that further research will show such developments in this direction as to make even a horse laugh. I am aware, indeed, that in these deductions I have encroached somewhat upon the argument for a Supreme and Omniscient Creator from design—an argument greatly magnified by theologians, and which scientists themselves admit has some force.

In submitting the case, in conclusion, you must bear in mind that if anything has been said which seems to conflict with reason or

even with common sense, yet this would by no means militate against our theory of evolution. Advanced thinkers in every age have been met with opposition by the ignorant, and sometimes with ridicule. All great discoveries have been for a time rejected, and their authors held up not only to contempt, but have been persecuted. Galileo was imprisoned; Columbus was regarded as a fool, or a lunatic; Roger Bacon was supposed to be in league with the devil; Harvey was denounced as a simpleton, and Jenner was driven through the streets of London upon a cow, amid the scoffs and jeers of brutal men and scandalous urchins. Men, therefore, in advance of their age and above the common herd, as we scientists are, must expect opposition,—expect at times ridicule; nay, it may be, active persecution. But what of this? History only repeats itself; and we are treading in the footsteps of the illustrious men who have gone before. We can afford, therefore, to endure persecution, with the full assurance of faith and hope that the ages to come—ages, perhaps, which will make even millions of years seem short—evolutions will be demonstrated as true, and regarded by all peoples, nations, and tongues, as one of the greatest achievements of the scientific world. And then, ladies and gentlemen, leaving out of view your humble servant, who addresses you to-night, the names of Huxley and Darwin will shine side by side with those of Galileo, Columbus, and Newton, with a radiance no less, but, if possible, even greater than theirs.

Thanking you for your kind attention, I bid you all good night.

RELIGIOUS DENOMINATIONS.—No. 6.

BY REV. L. W. BATES, D. D.

METHODIST PROTESTANT CHURCH.

IN 1875 the itinerant Methodist preachers in the United States severed their connection with Mr. Wesley, and organized themselves into the Methodist Episcopal Church;* arrogating to themselves the whole legislative, judiciary and executive authority of the new Ecclesia. But soon many of the preachers began to wince under the absolute appointing power of the Bishops, and in 1792 a fruitless effort was made to secure the right of appeal. In consequence of the failure, James O'Kelley and William McKendree (afterward Bishops,) sent in their resignations. About that time the people also became agitated in behalf of local preachers and lay delegations. These questions, together with the election of Presiding Elders,

* See minutes of that year.

continued to be discussed until 1828. In the General Conference of 1820 the proposition to make the Presiding Eldership elective had become so popular that the question was carried by a handsome majority; but at the close of the conference, when many of the advocates of the measure had returned home, its operation was suspended for four years, by which time its opponents rallied in sufficient force to defeat its resuscitation. The reformers ventured to petition the General Conference of 1824, but the Conference replied that they knew no such rights, nor comprehended any such privileges as those asked for by the petitioners. After that the reformers began to form themselves into union societies, for the purpose of a better concert of action, and to facilitate inter-communications on the subject. The right of laymen to participate in the legislative department of the church became so popular, and its advocates increased so rapidly, that the itinerant ministers became alarmed, and to protect themselves against the threatened reformation they inaugurated a system of expulsion. The charges were for belonging to the Union Society and reading the "Mutual Rights"—a paper published in behalf of reform—and upon that indictment they expelled without the right of challenging the jury, or examining witnesses, and in some cases upon an hour's notice, and in other cases worthy men were expelled by the minister without any trial whatever. These expulsions superinduced numerous secessions in various sections of the country.

Thus expelled from the church of their choice, they were compelled either to join other denominations, whose doors were everywhere opened to them, or to organize a New Methodist Church upon the basis they had advocated. They chose the latter.

In November, 1828, they held a convention in Baltimore, Md., at which they made a preliminary organization, and in 1830 another convention was held in the same place, which organized the Methodist Protestant Church. The doctrines of the church are Arminian, and its system of pastoral supply is itinerant, and aggrieved ministers have the right to appeal from an appointment. Trustees, stewards, and class-leaders are elected by the people. The churches are represented by lay delegates in both the General and Annual Conferences. Accused ministers and laymen are tried by their peers, and have the right to challenge the jury, examine witnesses, and to appeal, but no member of the jury shall vote upon the appeal.

The elementary principles are the following:

1. A Christian church is a society of believers in Jesus Christ, and is of divine institution.
2. Christ is the only head of the church; and

the Word of God the only rule of faith and conduct.

3. No person who loves the Lord Jesus Christ and obeys the Gospel of God our Saviour, ought to be deprived of church membership.

4. Every man has the inalienable right to private judgment, in matters of religion; and an equal right to express his opinion, in any way which will not violate the laws of God, or the rights of his fellow men.

5. Church trials should be conducted on Gospel principles only: and no minister or member should be excommunicated except for immorality, the propagation of unchristian doctrines, or for the neglect of duties enjoined by the Word of God.

6. The pastoral or ministerial office and duties are of divine appointment; and all elders in the Church of God are equal; but ministers are forbidden to be lords over God's heritage, or to have dominion over the faith of the saints.

7. The church has a right to form and enforce such rules and regulations only as are in accordance with the Holy Scriptures, and may be necessary, or have a tendency to carry into effect the great system of practical Christianity.

8. Whatever power may be necessary to the formation of rules and regulations, is inherent in the ministers and members of the church; but so much of that power may be delegated, from time to time, upon a plan of representation, as they may judge necessary and proper.

9. It is the duty of all ministers and members of the church to maintain godliness, and to oppose all moral evil.

10. It is obligatory on ministers of the Gospel to be faithful in the discharge of their pastoral and ministerial duties; and it is also obligatory on its members to esteem ministers highly for their work's sake, and to render them a righteous compensation for their labors.

11. The church ought to secure to all her official bodies the necessary authority for the purposes of good government; but she has no right to create any distinct or independent sovereignties.

Organized 1828 as associate Methodist churches by the expelled and their seceding friends of the Methodist Episcopal Church, for advocating lay representation in the councils of the church.

Constitution and Discipline adopted 1830, under the style and title, "The Methodist Protestant Church."

DISTINCTIVE PECULIARITIES.

1. But one order of the ministry—elders. "All elders in the Church of God are equal."
2. The mutual rights of the ministry and

laity : Equal representation in the Annual and General Conferences.

In 1858 the west and north suspended official relations with the southern portion of the church ; but in 1877 a reunion took place in Baltimore, Md., and the reunited church numbered, in 1880, 1,345 itinerant ministers, 755 unstationed ministers, 3,559 probationary members, 118,502 members, 1,509 churches, 290 parsonages, \$2,563,870 worth of church property, three colleges under its jurisdiction, viz.: one at Westminster, Md., one at Adrian, Mich., and one at Yadkin, N. C. The Church has three weeklies, viz.: *The Methodist Protestant*, at Baltimore, Md.; the *Methodist Recorder*, at Pittsburgh, Pa.; the *Central Protestant*, at Greensboro', N. C.; and a magazine at Adrian, Mich. It has also a mission and two missionaries at Yokohama, Japan.

AN ACOUSTICAL DEMONSTRATION.

PENNSYLVANIA MILITARY ACADEMY,)
CHESTER, Dec. 7, 1881. }

Editor *Microcosm* :

The experiments made by me with gasometers, the results of which were printed in your paper two months ago, have been confirmed with a superior apparatus. The gasometers did not give sufficient pressure to produce a full tone from the pitch-pipes, so I had constructed two large rubber bags, such as are used for lantern exhibitions, and inserted in one an inch gas-pipe, with a single brass burner tube (the lava tip being removed), and in the other bag, which had two necks, I placed incn pipes, each with three tubes ; thus giving me an opportunity to sound six pitch-pipes with one bag, if necessary. Placing the bags between hinged boards, I had them inflated, and set a fifty-six pound weight upon each. The bags were on stands, and at first were fifty feet apart, upon the open parade ground. I tested all the pitch-pipes by having each of the six on bag B sounded in alternate comparison with the one on bag A ; and all were found to compare equally, the neutral point being always half-way between the stations. I then experimented with the one in bag A against two, three, four, &c., in bag B, and herewith give the results,—the point at which the sound from the two bags appeared equal being always stated in feet from the bag A :

First trial, 50 feet between stations.

1	against 2	. . . . .	6 feet.
1	"	3	. . . . . 3 "
1	"	4	. . . . . 2 "

Second Trial, 100 feet between stations.

1	against 2	. . . . .	10 feet.
1	"	3	. . . . . 4 "
1	"	4	. . . . . 3 "
1	"	5	. . . . . 2 "
1	"	6	. . . . . 1 1/2 "

Third trial, 200 feet between stations.

1	against 2	. . . . .	30 feet
1	"	3	. . . . . 20 "
1	"	4	. . . . . 10 to 12 "
1	"	6	. . . . . 8 to 10 "

At the one hundred foot trial the assistant who managed the bag A remarked, that when four pipes were sounded from the distant station, he almost thought they were louder than his own, from which his ear was about two feet distant. Prof. Noyes quoted from a standard work on philosophy to the effect that four bells at forty feet would just equal in intensity one bell at twenty feet. Of course, the man who wrote that down had never tried it, neither had Prof. Noyes ; and I presume that I am the first who has actually performed the experiment of testing one sound against others of equal intensity. Instead of four to one at double distance, I find, *by actual trial*, four equal to one at twenty-four times the distance in one trial, thirty odd in another, and eighteen in a third. It is a very strong impression with me that the proportion would be found to remain the same, through all trials (outside of a few feet), if any perfectly accurate measure for sound intensity could be found. At present none exists better than the human ear, and, of course, the determination of the exact distance to a foot in a hundred, can hardly be expected of that organ. Hereafter I shall feel like questioning any scientific illustrative experiment, unless I *know* it has really been tried in the manner described. Years ago I knew that I could not sound two unison forks so as to produce silence, but like many others, let it go as a puzzle on the authority of Helmholtz, Tyn-dall & Co.; but these worthies will now have to step down and out, and give place to men whose eyes are opened a little wider.—Faithfully yours,

R. KELSO CARTER,
Prof. Higher Mathematics.

THE FUTURE OF THE PROBLEM.

BY REV. ROBERT TANSILL.

A. WILFORD HALL :

Dear Sir—I have just finished reading your admirable dissertation entitled "The Problem of Human Life Here and Hereafter," to which is added an exceedingly interesting and important treatise on the wave-theory of sound. I am of the opinion that you have clearly proved by philosophical facts and accurately logical reasoning, that the wave-theory for the transmission of sound through the air, is not only a scientific fallacy, but a real philosophical absurdity. Although I fully agree with you in your substituted corpuscular hypothesis,

for the transmission of sound as far as it is developed, yet it seems to require much fuller elucidation to make it acceptable as a scientific theory. I am very sure that the important element of electricity enters into and acts an essential part in the transmission of sound, and that the question can never be satisfactorily determined without involving its application. Indeed, the matter may be one of those mysteries of Nature which are unsolvable by a finite being. However, your very able review of the subject opens the door to further investigation, and will, doubtless, lead to more correct views of these interesting phenomena of Nature. As to your masterly reasoning on the problem of life, it has my unqualified approval and admiration. With regard to the strange notion of some scientists, that the human race originated from an insect found at the bottom of the sea called a *moneron*, the absurdity and impossibility of which you have so ably and conclusively exposed, renders the deluded authors of such nonsense pitiable indeed. If the first man came from a *moneron*, why does it not continue to propagate men, or at least higher organisms than its own? If an evolutionist was asked this question, I think he would have difficulty in arriving at an answer that would be entirely satisfactory to himself. Truly, "great men are not always wise," Those who ignore revelation, and adopt the spontaneous generation absurdity, seem not to know that all new species of the animal, vegetable and mineral kingdoms which have appeared in the world since the Creator finished His work in the beginning, are the consequence of general natural laws enacted for that purpose. Hence they cannot be spontaneous generations, since such productions, as living entities, must be generated from *nothing*, which is an impossibility. It is as much impossible to make something from nothing, as it is for two different things to be the same things. Resemblance and not sameness is found in nature.

In reference to the future of your noble book, I will remark, that from motives of overcaution, or the natural disposition of mankind to believe in, and blindly adhere to, long-established and cherished errors, new and scientific truths are, unfortunately, not immediately accepted. These obstacles, however, are only partial and temporary, and are finally overcome by time, learning, perseverance and experience. And as the greatest blessings of religion can only be enjoyed in a future state, so the real merits of the authors of great and beneficent discoveries in the arts and sciences are only fully appreciated by future generations.

THE PERSONALITY OF THE CONSCIOUS ENTITY AFTER DEATH.

BY ELDER C. S. TOWNE.

THE existence of an unseen universe is made certain by a line of phenomena which seem to be constantly projecting themselves into the midst of all our material surroundings. This power strikes us with awe; we are thrilled with their sudden coming, and forever perplexed with their mystery. These facts are universal, inseparably linked in the experience of everyone. Indeed, so accustomed are we to their constant occurrence that we have wholly failed to recognize the unanswerable lines of argument by which they bind us to the certainty of the unseen. I will here note a few of these facts: Death; sleep; the voice of conscience speaking against the determinations of will; the speaking power of man contrasted with the unspeaking silence of Nature; the everlasting and ever present action of the electro-magnetic fluid, with others that will naturally present themselves as I proceed with the argument. My last article presented the demonstrative power of death. The testimony of sleep comes next.

The waking man is conscious that the moving energy of his will, manifested through the body, is peculiarly and only his own. He knows that its complete action constitutes him an individual person. He realizes fully that he is not forced to move as a block of wood is moved when it is pushed. But he knows also that all this individual and independent power of action may be wholly separated from the body by the fact of death; and the question is, does the individual, conscious energy retain its personality after death? Is there any fact of universal occurrence that always answers yes, to this question? I answer that sleep, with its attendant dreams, is such a fact. Sleep is the image of death. Sleep is the partial separation of the conscious acting Ego from the body; death is the complete separation. The difference is only one of degree. This is made apparent in the deadly action of an opiate, or of cold. The person grows drowsy, sleeps, dies. Several facts are absolutely certain in all our sleeping and dreaming. First, we are totally separated from our bodily surroundings. We see nothing, feel nothing, know nothing of all that takes place about us. The ignorance of death is not greater. Second, it is certain that we are perfectly conscious somewhere else. We feel, we think, we say to ourselves that we are fully alive to all the surroundings; that they are real, and we are not dreaming. But when we wake from the sleep as conscious beings, we return to the body and once more

recognize its surroundings, and we remember that amid all the grotesque scenery of dream-land our personality remained unchanged. We felt it to be as perfect and substantial as we feel it to be when we are awake. There is still another fact connected with the state of sleep. While we realize that the personality of the conscious Ego is complete and substantial, we also realize, at times, that it is not chained by the power of gravitation. The feet are not bound to the path we tread. The conscious Ego, by a simple act of the will, lifts itself from the ground to glide, with astonishing ease and swiftness, for long distances over the roughness or marshes of the grounds through which we have wished to pass. And the power to do this seems so real and inherent, that the conscious Ego says to itself, "Why don't I always use it when I wish to go from place to place?" There are no phenomena of dreams that so vividly impress themselves upon the memory as this. Here is a power manifested in dreams that we do not possess when awake. I shall attempt an explanation when I come to speak of the properties of soul and spirit. It is seen, then, that the dreams of sleep establish the fact that the conscious energy of the human being retains its complete personality as fully when separated from the body as when within it. We know that this is so in the partial separation of sleep, and we know that this partial separation may pass to the completeness of death. If in sleep, then, there is not the slightest lessening of the consciousness of the Ego, but, on the contrary, the revelation of a conscious power, independent of gravity, in addition to the conscious powers of our waking moments, must not the conclusion be irresistible that the consciousness and personality of the Ego are wholly unaffected by the completeness of death?

If there were no dreams in our sleep, or, if there were a graduated lessening of consciousness as we sink to the depths of slumber, we should have, then, no certain data from which to draw any conclusion of continued personality after death. But the consciousness of dreams is common to all ages and races, and constitutes a continuous chain of facts, whose inductions lead to conclusions, the stability of which can never be shaken by any counter assertion. Death declares to us that the entirety of human energy is something entirely separable from matter. Sleep declares to us that when thus separated it retains its conscious personality unchanged.

MRS. ALEXANDER CAMPBELL'S LETTER.

A. WILFORD HALL:—

Editor of *The Literary Microcosm*.—I notice

in your paper each month a brief history of some one of the various denominations of professed Christians in the United States. I was greatly gratified to read, in your issue of October last, a short, but most comprehensive and strikingly correct, account of the origin, object, and progress of the Church of Christ (Disciples), as pleaded for more than fifty years ago by those valiant soldiers of the cross, Thomas and Alexander Campbell. Theirs was not a speculative, uncertain search after truth, but a return to the teaching and practice of primitive Christianity, as they understood it to be taught by our Saviour and his inspired apostles. It was both the rational and scriptural standard which they sought, and it has proved itself such by the increased light and sanctifying power their work has caused to be shed in this country, and also upon foreign shores, and may it go on to prosper, until all the children of God shall see eye to eye, become united under one King, and rejoice under the banner of His love!

I do most sincerely hope that your *Problem of Human Life and Literary Microcosm* may succeed in reaching the wide circulation they deserve, and that their teaching in opposition to false science may finally prevail. Your work is on the side of God and heaven, and I *can not* believe that your efforts will fail.—Very respectfully yours,

MRS. ALEXANDER CAMPBELL.

Bethany Mansion, W. Va., December 13, 1881.

DE SMET, KINGSBURY CO., DAKOTA, {
Nov. 25, 1881. }

Mr. A. WILFORD HALL:

Dear Sir—I have received two numbers, as specimens, of *The Literary Microcosm*, and curiosity being excited by the very boldness with which it attacks some of the most approved physical theories that have passed for established and demonstrated science, I wish to follow you out. So I send you 50 cents for the paper, beginning with Number 1, as I want the whole discussion. I am a Home Missionary of the Congregational denomination. Have been a teacher and educator, particularly in the physical sciences, and have been a lecturer in different departments—particularly geology. I have often been called to question the correctness of many received hypotheses that have passed for truth on the authority of distinguished scientists, and have learned that if theologians are, as a class, dogmatical, scientists, to the same extent, are *doggedly dogmatical*. I value the opinions of distinguished theologians, metaphysicians, and scientists as worth just what the reasons for their dogmas will weigh, except that in each I must accept

the unchallenged word of open investigation as to facts, where I cannot investigate. Example: I honor Darwin as a patient investigator of facts, while I have no respect for many of the opinions he founds upon his facts. I could never accept the dogmas of the materialistic evolutionists, because evolution can never be scientifically demonstrated. The theory is based on too many *unprovable hypotheses*. Divine revelation alone can prove it, if true. But we have divine revelation that commends itself to our spiritual nature, to prove creation by the sovereign will of a personal God,—“by the word of His power.” Consequently I can see only supreme nonsense in the “eternal subsistence of all potencies in an atom of matter, or the substitution of an infinity of atomic gods for one infinite and living God.” But the theory is contradictory of all logical and mathematical induction. “The greater can not be contained in the less:” Corollary,—the greater can not be evolved from the less. If the monkey is something less than a man, we can conceive of a monkey descended from a man; but if man is a monkey and *something* more, for that something more to be evolved from what lacked the very thing to be evolved, would be a *miracle* as stupendous as the creation of a full developed man by an almighty fiat. It resolves itself into *something springing out of nothing*. Let the evolutionist escape that conclusion if he can. I would like to correspond with you, and learn more of your views and objects. I may hereafter point out to you other so-called “scientific” difficulties in other departments that want clearing up.—Yours truly,

EDWARD BROWN.

THE CHASM BETWEEN MAN AND ANIMALS.

In the article of Professor Cheeks, in the Dec. *Microcosm*, is a quotation from Dana, in which the chasm between man and the highest man-ape is measured by the difference in brain-capacity. The ape, though really larger than man, has a brain-capacity of 34 cubic inches. The smaller man has a brain-capacity of 68 cubic inches. The statement is true; but it does not state and measure the chasm correctly.

Although we may not accept all the statements of phrenology, yet no one will deny that the brain is the organ used by the spirit in mental manifestations. From time immemorial men have observed that men with large frontal brain are distinguished for intellectual power, men with large coronal brain for moral and spiritual power, and men with large posterior brain for animalism. We can, then, assume that the spirit uses the frontal and

coronal brain in intellectual, moral, and spiritual manifestations, and the posterior brain in animal manifestations.

When we compare the posterior brain of man and the ape-man, the difference is not great,—the ratio is not more than two to one. But when we compare the frontal brain, the organ of intellectuality, the ratio is more than ten to one. When we compare the coronal brain, the organ of morality and spirituality, the ratio is almost infinite, the ape having scarcely a trace of that part of the brain. The comparison should be between those portions of the brain peculiar to man as man, and not between that portion he has in common with animals. Nor between the entire brain as a mass. In each case the extent of the difference, and the character of the difference, is lost sight of.

The writer calls attention to this oversight of scientists, in his *Problem of Problems*, but they do not seem to have appropriated the thought.

CLARK BRADEN.

OUT OF THE BODY.

PAUL speaks (no doubt of himself) of knowing a man who had seen wonderful things when probably “out of the body.” Is not such a condition or state reasonably supposable within the experience of certain persons in this life? Materialistic science denies its possibility, since the soul or spirit of man is not substantial—is nothing, in fact, but the physical motions of the smaller particles of the corporeal body itself. Hence, there is nothing as a conscious entity to be or exist out of the body, or in the body, for that matter. There is an incident recorded by Rev. Dr. Fitzgerald, editor of the *Nashville Christian Advocate*, in his sketch of the late Rev. Dr. Fisher, of California, which forcibly impresses one with the truth of man's substantial duality. The incident is worth reproducing here:

He lived in the atmosphere of the supernatural; the spirit-world was to him most real.

“I have been out of the body,” he said to me one day. The words were spoken softly, and his countenance, always grave in its aspect, deepened in its solemnity of expression as he spoke.

“How was that?” I inquired.

“It was in Texas. I was returning from a quarterly meeting where I had preached one Sunday morning with great liberty and with unusual effect. The horses attached to my vehicle became frightened, and ran away. They were wholly beyond control, plunging down the road at a fearful speed, when, by a slight turn to one side, the wheel struck a large log. There was a concussion, and then a

blank. The next thing I knew I was floating in the air above the road. I saw everything as plainly as I see your face at this moment. There lay my body in the road, there lay the log, and there were the trees, the fence, the fields and everything, perfectly natural. My motion, which had been upward, was arrested. and as, poised in the air, I looked at my body lying there in the road so still, I felt a strong desire to go back to it, and found myself sinking toward it. The next thing I knew I was lying in the road where I had been thrown out, with a number of friends about me, some holding up my head, others chafing my hands, or looking on with pity or alarm. Yes, I was out of the body for a little, and I know there is a spirit-world."

"KIND WORDS NEVER DIE."

REV. F. B. Donisthorpe, Friendville, Neb., writes:—

"Through all my years of study and extended reading, I have never been so gratified and fed with intellectual food as in reading the *Problem of Human Life*. I devoutly thank God that I have been permitted before my departure hence to feast upon such a bold and revolutionary work. I feel mortified, as I read on through this masterpiece of scientific and philosophic exploration, that I had not long ago been able to evolve the arguments you have so crushingly brought to bear against materialism. How much good the tens of thousands of Christian ministers could do in breaking down the barriers of infidelity if they possessed the weapons furnished in this book! God keep you humble and of sound mind in your great work."

Rev. Mr. Barnes, Salado, Texas, writes:—

"HALL & Co.—Gentlemen: I have received and read the *Problem of Human Life*, and I can truthfully and earnestly say that no human production has ever afforded me such unbounded satisfaction and delight. Indeed, to me it is like a book of veritable inspiration. The ease with which the author exposes scientific errors and weaves a web of facts and arguments for immortality, is simply wonderful, and reminds me of the manner in which our Lord confounded the scribes and pharisees. It is in reality the 'book of the age.'—Yours thankfully.

GEO. W. BARNES,

"Pastor of the Baptist Church."

Rev. M. P. Doyle, Lebanon, Pa., says:—

"I read every word of the *Microcosm*, and am delighted with it. It is a wonderful paper, and I am rejoiced to see it knock the conceit out of pretentious, self-styled scientists."

Hon. Alonzo Bell, Ass't Sec'y of the Interior, says:—

"I regard *The Microcosm* as the ablest scientific journal published in this country."

The *Kansas Herald*, of Dec. 9, says:—

"*The Literary Microcosm* is the best champion of Christianity, from a scientific standpoint, published in this country or any other. It is the great religio-scientific periodical of the nineteenth century, and materialism is doomed wherever it is read.

The *Lynchburgh Virginian* says:—

"*The Microcosm* is a literary and scientific newspaper devoted to the work of exploding the idle and purely speculative theories of modern scientists. It is edited by A. Wilford Hall, author of *The Problem of Human Life*,—one of the ablest works of the kind extant. Mr. Hall works with a master hand, and makes wrecks of the reputations of those who undertake to assail religion from behind the barriers that so-called scientists have erected."

Elder D. Oglesby, of Richview, Ill., writes:—

"I have for a good while been settling down to the conviction that very few men do their own thinking. I am so glad that *The Problem of Human Life* was written! It has convinced me that even the great Prof. Tyndall does not think for himself, but takes much that he teaches for truth upon credit. I have not read through your book yet, and, indeed, *I do not want to get through*. I never expect to read another such book. If all the countries of this world were consolidated into one government, I would rather be the author of *The Problem of Human Life* than to be the president, or monarch, of such a world-wide government. But, dear brother, 'do not rejoice that devils are subject unto you, but rather that your name is written in heaven.'"

Rev. Dr. M. S. Robinson, Rector of the Church of the Good Samaritan, Swan Lake, Dakota, writes:

"I believe if you continue *The Microcosm* in the same spirit and with the same ability with which you have commenced it, that great good will be accomplished. It has already put new life into many professed Christians, whose faith had been so broken down and covered up by the rubbish of scientific theories, as to cause them to lose sight of the facts, both of true science and true religion. I hope and pray that your efforts to clear away this rubbish and evolve light out of darkness may be crowned with success, and that you may be richly rewarded for your labor, both in this life and that which is to come."

Rev. A. L. Hutchison, Thompson, Ill., writes:—

"I am delighted with *The Problem of Human Life*, and consider it the greatest production, scientific or religious, of the nineteenth century. I see in its teaching a much needed revolution in so-called scientific theories, which will throw utter discredit upon the vaunted claims of the worst enemies of religion; for if they are proved totally unreliable in what they have made a life-long and special study, as you have shown, what right have they to express an opinion about that of which they know nothing practically?"

Prof. John B. Bradley, A.M., (Professor of Physics in Christian University, Canton, Mo.) writes:

"When your *Problem of Human Life* appeared you can never imagine the joy with which I read it. While principal of the Paris city schools I took the position that the soul of man was the exact counterpart of the body, having at least as many senses. Your book confirms it scientifically, and I most heartily wish it a wide circulation. I am using my endeavors to place it in the hands of about 100 intelligent young students in this university, and the good seed of its wonderful teaching is beginning to take root. I am sometimes utterly confounded to think that I have for twenty-five years been teaching for truth what I am now convinced is error."

THE NATURE OF FORCE.

REV. DR. GRAHAM'S DIFFICULTY.

CLARKSVILLE, IOWA, Dec. 22, 1881.

A. WILFORD HALL.

Dear Sir: I have read *The Problem of Human Life* with more interest than any book I have met with in many years. Some of its propositions I do not grasp yet,—would need a few test-experiments to feel positive about them. But if only half were true, still it would be the scientific book of the age. I have your cause so much at heart that I want to whisper a word of caution when you seem to me to go too fast. In the December number of *The Microcosm*, in your article on "The Nature of Force," you say: "A ball of gold falls to the earth, in common parlance, with much greater force than a ball of glass of equal size, not because it contains more matter, but because it sends out more powerful threads of gravity," &c. My difficulty is this: Would not the same difference appear between them if you should throw them at some thing you wished to knock down? And would not gold make a far more effective cannon-ball, go through the atmosphere farther, and strike harder than a ball of glass? I do not demand an answer, as your time is precious. I only suggest the difficulty, because other minds may stumble upon the same objection. With high regard,

GEORGE GRAHAM.

ANSWER.

Let us see if this apparent difficulty can not

be scientifically explained. A ball of gold, as we claim, weighs more than a ball of glass of equal bulk, not because the ball of gold contains more matter, but because it contains inherently more gravitative substance than glass. Our argument on that proposition in the December *Microcosm* we still consider sound and unanswerable, though the law involved is new to physical science. Now since gold falls to the ground with greater force than an equal bulk of glass because of the presence of a greater quantity of gravitative substance, the same condition would necessitate a stronger mechanical force to hurl the gold ball horizontally at a target, because this lateral motion has to overcome the greater inertia of the gold ball when at rest, and must continue to overcome its stronger tendency downward while in motion; and this mechanical energy of course must be exerted at every inch of motion in proportion to the superior gravity of the gold ball. The greater mechanical energy thus required to overcome its inertia is transformed into the ball's momentum after it is put into motion, and in this way constitutes its greater force in striking a target,—the same precisely as if the old view were correct, and its greater gravity depended on its greater quantity of matter.

Now it does seem to us that rational philosophy ought to teach any one, at least after the idea has been suggested, that the quantity of matter of a given body depends entirely upon the presence or absence of pores or vacant spaces in such body, and without the least reference to its weight. Hence, as glass is less porous than gold, it must contain more matter than gold. The same is true of water, which is freer from pores, after boiling, than any other known substance, being less compressible. It seems to us a gross physical absurdity to hold that nineteen cubic inches of water contain less matter than one cubic inch of gold, solely because the latter is heavier, especially in view of the fact that the water is nearer all matter than the gold,—containing, as it does, less unoccupied space!

We submitted this proposition to a professor of physics, one of those rare scientific investigators who does his own thinking, and asked him what possible objection could be urged against our view. He replied that the only objection he could think of was, that gold was heavier than glass because the *ultimate molecules* of gold were *larger* than those of glass, and consequently that the spaces separating these molecules in glass, as claimed by science, were larger than those in gold. But we deny the molecular theory, and consequently deny that there are any such spaces, or any such things in Nature as the *ultimate molecules* of a

body in any absolute sense of the term, though we may speak of *ultimate* atoms in a restricted sense, referring to the ultimate limit of microscopic vision. Suppose, however, the microscope should still be improved in the future, as it has been in the past, it is plain that what are now the ultimate particles of a body,—so small as to seem absolutely indivisible,—would be as large in appearance as cannon-balls, and each contain clusters of smaller particles without number. Then let the smallest of these be again magnified by still more powerful instruments, and they again would seem to be constituted of masses of still smaller particles, and so on *ad infinitum*, demonstrating the infinite divisibility of matter as the only admissible view, in direct opposition to the molecular theory. Hence, as this new departure in regard to the cause of weight in bodies can not be overthrown by the ultimate molecules of bodies, since no such molecules exist, we feel confident that no valid objection can be urged against it.

TYNDALL, HELMHOLTZ, AND MAYER.

WE are receiving many inquiries, asking: "If the wave-theory of sound be really true, and if the distinguished authorities reviewed in *The Problem of Human Life* still have full confidence in its correctness, how happens it that they can keep silent upon the subject, with your damaging arguments circulating far and wide, and so forcibly put as to convince experienced professors of physical science that there is no foundation whatever for the current theory?"

We give it up. One thing, however, is sure. Prof. Tyndall and Prof. Mayer have both received a copy of our treatise on Sound, as we have a letter from each of them acknowledging the receipt of the same. Prof. Tyndall wrote his acknowledgment, as we happen to know, the very day he received the book, and evidently before he could have had time to read it, stating (to use his own words) that it was "an infinitely amusing book." Possibly after he had *read* it, he became more serious over it. Prof. Mayer admitted that from what he had read of the work at the date of his writing, he was convinced that he had something to "learn" as well as something to be "amused" at. These eminent physicists can not, therefore, now claim that the book is unworthy of their notice, since they have both noticed it so far as to write to us, expressing their opinions about it. Now what hinders the same great authorities from showing, through the columns of *The Microcosm*, if they feel able to do so, that our arguments on the

subject are fallacious, and that the wave-theory, as taught in all colleges and universities, is scientifically true? Nothing would so interest our thousands of scientific readers, or so benefit our colleges and universities, as to have one of those renowned authorities on acoustics come to the rescue of their favorite theory, and show that this "infinitely amusing book" is as false on the subject of sound as it is laughable. Our readers have had so much serious argument on solid scientific matters that they would no doubt relish a little fun. We would like to inaugurate a department of "scientific amusement" in our columns by allowing one of these famous scientists to attempt each month a defense of the wave-theory as laid down in their books on the subject, and as taught in all schools and colleges.

In the August number of this journal we cordially invited either Tyndall or Mayer, or any other representative acoustician, to occupy two columns every month for a year or longer in defense of the current theory of sound, with the understanding that we shall occupy an equal space in reply. We have had no response to this generous proposal. Why is this thus? Prof. Mayer is just across the river from this city at the Stevens Institute in Hoboken. He has shown that he is deeply interested in having a true knowledge of acoustical science prevail, as may be judged by several books and essays on the subject from his pen. But why is it that since this treatise has been before the public (nearly four years) not one syllable has appeared either from his or Prof. Tyndall's pen in favor of the old theory of sound? Echo answers, Why? We do not like to be personal, but we trust that Prof. Mayer will pardon us if we extend this invitation directly to him as the leading exponent of the current theory in America, and thus cordially invite him to write for *The Microcosm* two columns a month in vindication of that theory. We promise him the kindest of treatment and a wide hearing, as our paper is taken and read in hundreds of colleges all over the country. If he wishes to entertain and instruct students of science with a thousandfold better facility than by lecturing to a handful in the Stevens Institute, he here has a grand opportunity to reach many thousands of just such investigating minds every month,—young men who will devour with eagerness every word he writes. Why can they not have the benefit of his ripe experience and long familiarity with the principles of acoustical science as now taught?

The articles on Sound in the October, November, and January numbers of *The Microcosm*, in review of Prof. Tyndall's tin-tube experiment and some of his other ridiculous

illustrations, have caused one universal "Oh!" for that great physicist from our readers. One investigator of sound—H. Tiebout, of Byron, Texas,—facetiously remarks: "Poor Prof. Tyndall should now convert his tin tube into a speaking-trumpet, through which to announce to the whole world his egregious mistakes, and the utter overthrow of the wave-theory. Your articles on those subjects are telling, and are worth ten times the subscription-price of *The Microcosm*." Yet Prof. Tyndall moves along with his great reputation as a physicist as if nothing had happened. Believing, however, as we do, that this incessant fusillade kept up in the columns of *The Microcosm* will in time penetrate the hide of the scientific rhinoceros, we have laid in a good store of suitable ammunition.

Several of our correspondents have inquired the post-office address of the professors reviewed in *The Problem of Human Life*, in order to write them on the subject. The following will be sufficient to reach them:—

Prof. TYNDALL, care of Taylor & Francis, Red Lion Court, Fleet Street, London, England.

Prof. HUXLEY, Royal School of Mines, London, England.

Prof. HELMHOLTZ, Berlin University, Berlin, Germany.

Prof. HAECKEL, Jena University, Jena, Germany.

Mr. CHARLES DARWIN, London, England.

Prof. MAYER, Stevens Institute, Hoboken, N. J.

SOMETHING NEW ON PENDULOSITY.

PROF. JOHN A. KERBY, of Flat Creek, Tenn., has written us two or three letters in which he endeavors to prove by scientific argument and illustration that the pendulum or vibrating string does not rest at all, even for an infinitesimal time, when it reaches the end of its swing and starts back. His reasoning upon this subject is very ingenious, and his illustrations are such as to prevent very serious difficulties to the minds of those who take the opposite view. We had taken it for granted, as universally taught and believed, that the pendulum-ball or vibrating string must and does experience a brief period of rest, for how, we ask, can it stop and turn back without such rest, though it be very small? This view we took in a letter to Prof. Kerby; but we confess his reply has rather nonplussed us. Suppose, he suggests, that two bodies, one large and the other small, are moving slowly toward each other, and meet without compression or indentation, and that the smaller body turns back by the contact with the larger body, and moves with it without the larger body stopping,—can there, by any possibility, be a period of rest,

even infinitesimally short, in the smaller body? We confess we can see no chance for rest in the smaller body, if there be no stoppage or indentation of the larger one. The same thing he illustrates by a pitman-saw where there is no play at all in the journal or joints. How, he asks, can the saw, when it reaches the extreme of its upward motion, rest, if there be no stoppage to the wheel that moves the pitman? Could the upper point of motion be observed by the aid of the most powerful microscope, and should the wheel barely be moved, he contends that the slightest turn to the right or left would reveal a proportionate up or down motion of the saw; and that if we did not observe it, it would only be because the magnifying power of the glass did not reveal it. Can any one answer this argument? We confess we can not. We begin strongly to suspect that the supposed rests of a pendulum-ball at the extremes of its swings have been mistaken for the slowing-up of its motion as it reaches the returning-point, and that we have thus conceded more than we need to have done in our arguments against the wave-theory of sound on the exceedingly slow motion of vibrating strings. If so, we are indebted for this discovery, of absolutely no period of rest in vibrating strings (thus making their movement still slower), to the careful observation and close reasoning of Prof. Kerby. For the present we submit the matter to our thoughtful readers. If a period of rest can not be demonstrated, which now seems to us impossible, then Prof. Kerby is justly entitled to the credit of a genuine discovery in physical Science.

LECTURE ON EVOLUTION.

OUR readers should not fail to study Rev Dr. McKnight's advanced theory of evolution, given in another column, especially the development of violin music by differentiation from the interior structure of the cat. His view of the harmonious similarity of the sounds of the two instruments in running the chromatic scale, especially when one chances to step on the tail of the living instrument, is admirable. Dr. McKnight has certainly struck the *keynote* of the development-theory; and we shall take pleasure in mailing a marked copy of this paper at once to Mr. Darwin.

SOME MISTAKES OF INGERSOLL.

COL. ROBERT G. INGERSOLL has assumed the position of an "advanced thinker," in science as well as on other subjects. In his writings we are constantly confronted with such expressions as "modern science," "the science of the

nineteenth century," "modern scientific progress," &c.; and this to such an extent that persons who are not well informed in regard to the results of modern scientific research are almost led to believe that he knows something of science, at least so far as the elementary principles are concerned,—whereas the truth is that in regard to the first principles of mathematics, physics, and chemistry, it is demonstrable that he knows absolutely nothing that is of any value to himself or to any one else. He has not even sufficient knowledge to enable him to read our most popular scientific authors, such as Tyndall, understandingly; and when he attempts to quote them from memory every sentence is misrepresentation, and every statement blunder. A single specimen of his mistakes, taken from his lecture which he calls "Some Mistakes of Moses," is abundantly sufficient to substantiate all that we have just said. At page 4 of the printed lecture we find the following: "I don't believe that he [Moses] knew that it [the earth] was turning on its axis at the rate of a thousand miles an hour; because, if he did, he would have understood the immensity of heat that would have been generated by stopping the world. It has been calculated by one of the best mathematicians and astronomers that to stop the world would cause as much heat as it would take to burn a lump of solid coal three times as big as the globe."

It would be very difficult for any ordinary writer to compress into the same space an equal amount of blundering. In the first place, it does not "take" much heat to burn a lump of coal. After the coal gets to burning it produces all the heat that is wanted. Secondly, the earth does not turn on its axis at the rate of a thousand miles an hour. A narrow band round the equator has this velocity; but as we pass from the equator to the poles the velocity becomes less and less, until finally, at the poles, the velocity is slower than that of the hour hand of a watch. The mean velocity of the earth on its axis is that of the point which lies at the center of gravity of a semi-circle of which the earth's axis is the diameter. [This point is readily found by the formula: Distance of c from axis = $424r$.] This velocity is very nearly 438 miles per hour, or considerably less than one half of that stated by Ingersoll. He is confounding two entirely distinct motions, and his general knowledge of natural philosophy is not sufficient to enable him to detect his error.

That the mistakes we have pointed out are really blunders, any "mathematician and astronomer" can show. But as some of our readers may not be able to follow the calcula-

tions of the "mathematician and astronomer," we may cite the following illustrations. Railroad-cars have been propelled at the rate of over a hundred miles an hour, and stopped in a very few seconds. Did any one ever observe that they became perceptibly hot to the touch when so stopped? And yet this is nearly one fourth of the mean velocity of the earth on its axis.

Another illustration may be seen in fly-wheels and circular saws. They have been made to rotate with a velocity nearly one-third that of the mean velocity of the earth on its axis. Did any one ever notice a dangerous rise of temperature when they were brought to rest? We have never observed any such thing, although we have had considerable experience in such matters. That motion can be converted into heat (or rather cause heat) we know very well; but not to anything like the extent Col. Ingersoll claims. Axles and bearings have been made hot by friction; but the extent to which they are heated by changing from any ordinary velocity to a state of rest is scarcely perceptible to the keenest sense. If Moses were here to show up the mistakes of Ingersoll he would more than get even with him.

A YOUNG SCIENTIST.

DECREASE OF SOUND-INTENSITY.

THOSE professors of physics who have ridiculed our departure in acoustical science, and sneeringly asserted that our objections to the wave-theory were unworthy of notice, will no doubt be interested in reading elsewhere the report of experiments at the Pennsylvania Military Academy by that careful physicist and mathematician, Prof. R. Kelso Carter, A.M. These are perhaps the first full and complete experiments ever made and recorded for testing the truth of the venerable law of acoustics, lying at the basis of the wave-theory, that sound-intensity decreases as the square of the distance from the sounding instrument. This series of experiments, as will be seen by the report sent us by Prof. Carter himself, completely breaks down this law, and thus sweeps away the very foundation of the theory of acoustical science as taught in all schools and colleges throughout the world. We are not at all, however, puffed up at the thought that the first intimation of the fallacy of this law or of the wave-theory based upon it is to be found in *The Problem of Human Life*; but we confess to a degree of gratification when we read such an overwhelming answer as that of Prof. Carter's to the stereotyped assertion that our arguments against the popular theory of sound are unworthy of serious attention.

THE CORPUSCULAR HYPOTHESIS.

SINCE publishing our arguments against the decrease of sound-intensity as the square of the distance, we have received many letters from professors of physics, asking in what way our own view, that sound is substantial, differs from the old theory of air-waves as regards this accepted ratio of decrease. If sound consists of corpuscular emissions radiating from the sounding body in all directions, our correspondents can not comprehend how the intensity or loudness of any given sound can diminish except in accordance with this law, the same as the quantity of air increases from the center. Of these letters we copy only one from Prof. George Blanchard, Union Grove, Iowa, to give the exact point of the objection.

A WILFORD HALL.

Dear Sir: I have carefully read your work, or the two chapters of it on Sound, and I must say that in my judgment you have hopelessly shattered the wave-theory. But yet there are a few basic objections to your own hypothesis of corpuscular emissions which seem to me to be unanswerable, and I therefore appeal to you as the only authority on the subject. If sound is the emanation of substantial corpuscles radiating from a sonorous body, it is manifest that the intensity of a given sound must depend directly upon the number of such corpuscles which enter the ear. Thus, for example, 1000 such corpuscles striking the tympanic membrane at one time will necessarily produce a sound four times as loud as if but 250 corpuscles entered the ear. In what manner, then, does this differ from the law of decrease as the square of the distance, lying at the foundation of the wave-theory? This law you have covered with ridicule and shown to be fallacious; and in this way fatally assailed the wave-theory, as taught by Prof. Tyndall. As your own hypothesis involves the same ratio of decrease to all intents and purposes, how is it possible to save the corpuscular theory from demolition by the very arguments and facts you have urged against this venerable law?

Yours truly,

GEORGE BLANCHARD.

This correspondent clearly expresses the objection as urged by, probably fifty different professors. We have waited for the present opportunity to reply to all, as this number of *The Microcosm* will be sent to many professors of physical science not subscribers to our paper. We will now undertake to show that while our hypothesis of substantial emissions logically involves the dispersement of the sound-corpuscles according to this law,—the square of the distance,—just as Professor Blanchard urges, yet that it is in perfect harmony with the arguments we have presented against the decrease of sound-intensity according to this law. We ask careful attention to the points we are about to make.

In the first place, we deny that the loudness

of a given sound necessarily depends, according to our hypothesis, upon the number of sonorous corpuscles entering the ear, though we freely admit that these corpuscles must scatter or become sparser as they radiate from the sounding instrument, and thus must enter the ear in numbers diminishing according to the law in question. How is this apparent self-contradiction to be explained? Simply by assuming, what in a moment will strike the reader as self-evident, that near to a very loud instrument only a certain quantity of the substantial corpuscles of sound which enter the ear can take effect upon the tympanic membrane to produce the sensation of tone, since no motion is thereby communicated to the membrane, and that a number of corpuscles so great may readily enter the ear when near to the instrument that a large portion of them may prove to be surplusage, and in this way may cause the sound to be only about as loud to our sensations as when we are much farther away from the instrument, and consequently when the ear receives but a small fraction of that number of corpuscles. A small pinch of sugar, for example, scattered over the tongue and gustatory membrane, will taste just about as sweet as would a whole mouthful of sugar, thus proving that the intensity of this sensation bears no fixed relation to the number of saccharine corpuscles that may be taken into the mouth. Is not this plain? Then why should it be different with the sensation of tone? Assuming sound to be substance, we can easily suppose its corpuscles to affect the auditory sensation in an analogous manner. At a foot from a common pitchpipe we are certain that the tone sounds only about twice as loud as at a distance of twenty feet, though four hundred times as many of the original sound-corpuscles, according to our hypothesis, enter the ear at one foot from the instrument as at twenty feet.

This, however, is not the only factor that comes into play, according to the corpuscular hypothesis, in determining the relative decrease of sound-intensity. At page 155 of *The Problem of Human Life* there is a provisional hypothesis framed to account for the deflection of sound around buildings, &c., in which it is assumed that the original corpuscles issuing from the sonorous body may divide and subdivide into smaller corpuscles, these again into still smaller, and so on *ad infinitum*, each subdivision radiating its scintillations of sound, so to speak, in all directions and at all possible angles, the same as the sounding body radiates the original emanations in straight lines. This subdivision of the sound corpuscles, as they radiate to considerable distances from their

source, not only explains the inflection and diffusion of sound, but it may play an important part also in preventing the decrease of sound-intensity as rapidly as required by this law of the sphere, or may even account for its decrease more rapidly, as in the case of very weak sounds like that of the gnat.

A scattering few of these sound-corpuscles from the steam siren, for example, may enter the ear ten miles distant from the instrument, and may there so subdivide as to diffuse themselves over the sensitive auditory membrane, and thus cause the sound to be distinctly heard; or the feebleness of the sound may depend upon the previous subdivisions of the corpuscles in traveling the ten miles. Yet it is obvious that this sound would be still louder at such a distance could the ear receive more of the original and direct sound-corpuscles from the instrument, as proved when the number entering the ear is augmented by a funnel or ear-trumpet.

But all these phenomena, so beautifully and consistently accounted for by the corpuscular hypothesis, have no explanation whatever on the assumption that air-waves and tympanic vibrations are alone the cause of sound. Let us look, for a moment, at the manifest defectiveness of that hypothesis. Prof. Tyndall says:—

"We have already learned that what is *loudness* in our sensations, is, *outside of us, nothing more than width of swing of the vibrating air-particles.*" "Thus is sound conveyed from particle to particle through the air. The particles which fill the cavity of the ear are finally *driven against the tympanic membrane* which is stretched across the passage leading to the brain. This membrane, which closes the drum of the ear, *is thrown into vibration, its motion* is transmitted to the ends of the auditory nerve, and afterwards along the nerve to the brain, where *the vibrations are translated into sound.*" —(Quoted and commented upon pp. 78, 175, of *The Problem of Human Life*.)

Now, as the vibrations of the tympanic membrane alone constitute the sensation of sound, it is obvious that the distance the membrane oscillates to and fro must determine the intensity or loudness of the sound, just as the distance a string vibrates to and fro determines the real quantity of the sound it produces. And as the distance that the tympanic membrane vibrates depends upon the size of the air-waves striking against it, or, which is the same thing, the "width of swing of the vibrating air-particles," it follows conclusively, if sound outside of us consists of air-waves, that these waves must decrease in size or width of swing as the square of the distance from the sounding body, just as Prof. Tyndall teaches. This would necessarily cause an "enfeeblement of

motion" of the "vibrating air-particles" in like proportion, and this would correspondingly diminish the amplitude of vibration in the tympanic membrane, which would also decrease the intensity or loudness of the sound conveyed to the brain in the same ratio, or *as the square of the distance*. Hence, as the experiments of Prof. Carter at the Pennsylvania Military Academy, as reported in this number of *The Microcosm*, demonstrate the law of decrease in sound-intensity as the square of the distance to be erroneous, it conclusively overthrows the wave-theory while not interfering in the slightest degree with the corpuscular hypothesis, as just explained. To show beyond doubt that we do not misrepresent the current theory, but that the actual loudness of sound in our sensations is in proportion to atmospheric motion outside of us caused by the air-waves sent off from the vibrating instrument, Professor Tyndall says:—

"The greater volume of sound heard everywhere throughout the room *can only be due to the greater amount of motion communicated to the air of the room.*" "The *loudness or intensity* of a note depends on the *distance within which the separate atoms of the air vibrate.*" "If we hear one sound louder than another it is because our nerves are hit harder in the one case than in the other."—*Lectures on Sound*, pp. 11, 48, 73.

We thus prove positively that loudness in our sensations, according to the wave-theory, depends exactly and entirely upon the force with which the tympanic membrane is caused to vibrate and the distance through which it oscillates, and that these depend exactly and entirely upon the "width of swing of the vibrating air-particles" outside of us, whose "enfeeblement of motion," as they advance, must depend exactly and entirely upon the square of the distance from the sounding body. Hence, by demonstrating, as Prof. Carter has done, that loudness does not vary inversely as the square of the distance nor come any where near it, he shatters the wave-theory, while actually harmonizing, as before remarked, every observed fact with the corpuscular hypothesis.

TRACTS FOR THE PEOPLE.

WE are pleased to learn that Mrs. R. P. Doyle, of Owen Sound, Canada, has had printed a large edition of the second chapter of *The Problem of Human Life*,—"Matter, Substance, Force, Life, Mind, Soul, Spirit, God,"—for general circulation in the Dominion. An edition of several thousand copies of such tracts or pamphlets costs but a few dollars, and may start many minds to thinking on the road that will result in permanent good to the world.

Who will follow the example of Mrs. Doyle? We can produce to order such tracts at a very low price for any public-spirited friend of the cause at a distance, 1000 or more at a time, and will charge only the exact cost. They can be printed and published in the name of the person sending us the order; and in this way many persons can become home missionaries in the cause of truth who have not the ability to preach either with the voice or pen.

DISTINGUISHED MEN.—No. 4.



HELMHOLTZ.

HERMAN LUDWIG FERDINAND HELMHOLTZ was born in Potsdam, Prussia, Aug. 31, 1821, and consequently is now 60 years old. His picture from which our engraving is made, was taken some ten years ago, and therefore represents him as much younger. Potsdam was also the birthplace of Alexander Von Humboldt, thus giving to the scientific world the two most eminent physicists Germany, or even Europe, has ever produced. Helmholtz, like Tyndall and Huxley, in fact many other renowned scientists, showed very little promise of brilliancy when young. He even disliked study or severe mental application, and was induced to keep at school more as a matter of duty by the urgent demands and promptings of his father than by any innate love of study he felt. His father was a great but unpretentious scholar, full of knowledge upon almost every subject; and being a teacher he saw the intellectual points of his son, and determined to develop them, and, if possible, make him famous. It was not long before the sluggishness of intellect in the young Helmholtz began to give way to ambitious thoughts, and the remarkably developed brain, shown so clearly in his picture, began to assert itself. As if by a single bound of intellectuality, before he was 17 years old he almost distanced his classes in

whatever branch of study he undertook to master.

From the Potsdam school, where his genius had been so clearly demonstrated, he was sent to the Military School of Medicine at Berlin, known as the Frederick William Institute. Here he had ample facilities for gratifying his taste for medical, surgical, anatomical, and physiological investigation, to which departments of science he has since given so many valuable contributions. For three years he pursued his studies and investigations at this institution with unceasing perseverance, and graduated with the highest honors at the age of twenty, closing his last term with a dissertation on "The Nervous System of Invertebrate Animals," which created a marked impression upon the members of the Faculty and the leading naturalists of the capital.

From this successful beginning his future career was only a succession of scientific triumphs. He wrote upon almost innumerable themes, embracing nearly every department of scientific research. He was one of the first—if not *the* first—to advocate the doctrine of the Conservation of Force. He made extensive experiments and investigations to determine the grounds for believing in spontaneous generation. He made some of the most careful investigations of the structure of the eye, and the action of light upon the retina and optic-nerve; but his greatest achievements were those pertaining to the structure of the ear and the phenomena of sound. These latter researches were published in a large volume called "The Sensations of Tone," and constitute the textbook, *par excellence*, upon the theory of acoustics as taught in all colleges in this country and Europe. Whether the wave-theory of sound is correct or not, Helmholtz is unquestionably its ablest exponent, living or dead; and his investigations are the foundation upon which all other writers on sound now build, and from which they draw their inspirations.

Helmholtz is an evolutionist of the Haeckelian type; and though not prominent as its advocate he has nevertheless yielded his full acceptance of the doctrine. As an example of the interest he takes in the evolution cause, at a congress of natural philosophers assembled at Speier, he proposed an open vote of all present to ascertain their views of Darwinism. On calling the roll every one voted that evolution was a true theory.

MRS. ALEXANDER CAMPBELL'S LETTER.

We publish elsewhere a letter from this esteemed lady, the widow of the late Alexander Campbell, President and founder of Bethany

College, and the starter of the reformation known as the Church of the Disciples, of which our lamented President Garfield was a member. We are pleased to be assured, from the pen of this distinguished lady, that our notice of that denomination in the October *Microcosm* was "comprehensive and strictly correct." May she long live to keep fresh the memory of her eminent husband.

NEWTON AND GRAVITATION.

LAST month we promised to file in this issue of *The Microcosm* our objections to Newton's law of the decrease of gravitation, namely, that the earth's attraction of bodies on or above its surface, varies inversely as the square of the distance from the center, or in the language of modern science as deduced from the 75th Proposition of Newton's *Principia*, that the earth attracts all spheres or other bodies outside of it the same precisely as if its attractive force were all concentrated in a single corpuscle at the center. From this proposition arises the formula suggested by Newton, and as now held by all astronomers, namely, that the *radius*, or semi-diameter of the earth (4,000 miles) is the proper and correct unit of measure for calculating the ratio of decrease in the earth's gravity, and for estimating the true weight of bodies on and above the earth's surface, as far off as to the moon and the distant planets. This assumed unit of measure with the calculations growing therefrom we pronounced in the December *Microcosm* to be nothing but "guesswork," and expressed our belief that it was not only false but demonstrably absurd. We are now prepared to make that declaration good, and to show to a person of the most ordinary intelligence that this proposition of Newton and the teachings of modern astronomy based thereon, are in direct conflict with observation, are contradicted by Newton himself, and that the earth, moon, sun, and planets *really weigh about double as much as Newton's formulas and propositions make out*. This we admit to be a fearfully radical and revolutionary attack upon established science, and that it will seem to mathematicians and astronomers as too wild and visionary to be entertained for a moment, or even to be seriously examined. But wild and insane as it may appear, it will be demonstrated to the letter.

Although we are *now* prepared to do all we have here announced, we have not room for our proofs and arguments in this number, owing to the absolute necessity of presenting, as we do herewith, a specimen of the adverse criticisms we are receiving, and in this manner

preparing our readers for the almost infinite importance of our position to science, if it can be sustained. To forewarn scientists, and thus pave the way for the March number of *The Microcosm*, in which the demonstration will appear, we give space to a most scathing argumentative arraignment of ourself for taking such a preposterous position against the admitted demonstrations of Sir Isaac Newton. This rebuke is from the pen of one of the ablest scholars and conscientious scientists in the West—Rev. Dr. Smith B. Goodenow, of Battle Creek, Iowa, a mathematician of more than forty years' experience, and a writer on astronomical subjects. We print the salient points of Dr. Goodenow's two very interesting letters to us, and his kindly reprimands of ourself for daring to doubt Newton's *Principia*, or call in question the established principles of gravitation as they bear upon astronomical science. In this manner we are enabled, in advance, to lay before our readers a concise statement of Newton's laws and principles, and thus the better to prepare them for our own revolutionary departure, when it is presented. To this same end we also give, after copying Dr. Goodenow's terse criticisms, one of our own letters in reply, and will thus leave the controversy to effervesce till our final argument in the March number. We are thus content to smart, as it were, under the Doctor's kindly lash of criticism for one month, as condign punishment for recklessly attempting to disturb the immortal fame of earth's greatest philosopher, since the overthrow of Newton's proposition on this subject, as declared below by our friendly critic, "would be the most stupendous overturn in science the world has ever seen." We have no objection to concede this, as it will in a measure explain to the Doctor the reason why so important a demonstration in science was purposely reserved for our readers rather than dealt out in private correspondence. We may not know what we are writing about, nor the magnitude of the contract we have taken on our hands, in thus attacking any part of the law of gravitation, or in attempting a criticism of Newton's cardinal propositions; but we believe our readers will concede that we honestly *think* we know, or we would not thus dare to jeopardize *The Microcosm* by printing such reckless and revolutionary doctrines. *The Christian Standard*, of Cincinnati, in a recent editorial reply to our December article, which it generously copied, remarks:—

"We never before suspected that *The Microcosm* questioned the law of gravitation. It will be useless to pursue our suggestions on the law of sound, so long as this, the most perfect gen-

eralization of known science, is subjected to such criticism."

The *Standard* will please take notice that this "most perfect generalization of known science," so far as relates to the ratio of the decrease of gravity, is peremptorily denied; and Bro. Errett will therefore wait patiently for the disclosures of the next *Microcosm*. The following is the substance of Dr. Goodenow's criticisms:—

"BATTLE CREEK, Iowa, Dec. 3, 1881.

"Editor of the *Microcosm*."

"Dear Sir: I am a Congregational preacher of many years' experience, an A.M. of Bowdoin College (1841) and a theological and scientific investigator of some pretension, having published considerable (with commendation) upon those subjects. I was therefore much interested when, about a month since, I received from you the September *Microcosm* as a specimen copy. I devoured it with avidity; and, though I could not see the adequacy of your answer to 'Scientific Puzzle, No. 1,' yet I was much pleased with your exhibit of *substance* as including the spiritual as well as the material, this being a point that I have long insisted on. I had such hopes of help from you that I was about to mail the \$2 for your advertised work, when I (this week) received another specimen copy,—the December *Microcosm*."

"What has been my astonishment, upon examining it, to find you in several articles controverting the law of *gravity decrease as the square of the distance*; and doing so through a mistake (as it seems to me) of the method and basis of that law. You say:—

[Our friendly critic here quotes long extracts from the December *Microcosm*, and makes lengthy criticisms, which we omit.]

"As to the basis of the gravitation law. 'We ask for some rational data,' you say, 'by which is obtained this peculiar law of reckoning decrease of gravity from the center, while it actually decreases only from the surface.' And you confidently deny that there are any such rational data for this 'infinite absurdity.' But now go to Newton's *Principia* (Book I, Prop. 75,) where he demonstrates mathematically the first principles of the gravitation law, as a matter of simple dynamics; and where (as Herschel remarks) 'Newton himself has shown, that in the case of spheres, the attraction (*outside* on each other) is precisely the same as if the whole matter of each sphere were collected into its center.' (Her. Ast. p. 237.) So that, at the surface, for the average of all the particles attracting, 'the distance is the radius of the sphere' (p. 239.) He goes on to prove this is so at any point farther off, say two radii distant, or sixty to the moon, &c.; but that, if less than one radius be taken, due allowance must be made from the value given by this law (*which treats the sphere as if all condensed at its center, as indeed it is gravitationally to bodies outside of it*),—allowance for the fact that part of the matter attracting is below and part above the point now supposed to be taken. That peculiar fact makes this first or radial distance a legitimate exception *actually* to what holds *mathematically* as the universal law. So that in applying the gravitation law

downwards, *we conceive of the globe as if condensing and receding before us*, till it has but half the former radius, or to any other more condensed size. And such a conception is proper for the purposes of a universal law, the result to be corrected for any *extra circumstance coming in* outside the law. For, the gravitation law fully expressed has always been this: The attraction of spheres on one another (that is, outside of their surfaces) is directly as their mass, and inversely as the square of the distance from their centers (*where the attractions of all the particles average together as if concentrated there*).

"When the law is thus fully understood, does it not give us 'rational data'? Is it 'infinitely absurd'? Newton's *Principia* certainly furnishes at least a *show* of arguments. If you or any one can disprove Newton's Prop. 75 as to the center of spheres, and his other demonstrations proving the inverse square of distance, away even to the moon, &c.,—do so, by all means; and I and all lovers of truth will say 'Amen' to the stupendous overturn that will be thus wrought in science. But do not misinterpret the law, and so fall into a needless abuse of it.

"All mortals are fallible; and a man may be right in his great principles, yet err in some details. But the true enlightener is honest; and if you frankly confess the mistake into which (I think) you have unwittingly fallen in this matter, I will still have faith in your candor and fidelity to truth, and will hope for help from the study of your work. Believe me kindly and sincerely yours,

"SMITH B. GOODENOW."

[The following are portions of Dr. Goodenow's second letter.]

"1. Concerning Newton's demonstration that the average attraction of all the several particles of a sphere upon any other sphere outside of it is the same as if all those particles were concentrated at its center, you say: 'I feel the force of it; but it does not prove the law correct [in regard to gravity], *any more than* it proves it correct in regard to the decrease of sound-intensity or that of magnetism.' Why should you thus think that the positive proof as to attraction's or gravity's method of working has no more weight upon the *gravity* subject than it has upon the subject of sound or magnetism?—with which, of course, it has nothing to do. Say simply, This demonstration as to the center is not *alone* sufficient to *prove* the law of squared distance inverse, but only lays a *basis* for it; and so far you are correct. This point, forming the third head in my last letter, did not purport to give the *full proof* of the gravitation law. It only answered your view that there was *no basis* for the theory that the whole notion of *reckoning from the center* was 'infinitely absurd' on its face. So far your view is plainly set aside. Do you not see that it will be hard to convince me that 'Newton's law is all guess-work,' as you twice declare in this letter? It surely *starts*, at least, on a sure basis of demonstration, from the center, however it may make out afterwards.

"2. You claim that Newton was wrong in his views on some subjects, and you ask, 'Why might not Newton be proved wrong in other matters as well, even in his assumed basis of

the decrease of gravity?' I answer, That was the very proof I called for in my last letter, and I call for it still. I stated how cheerfully I, in common with all scientists, would hail such evidence,—not mere assertions concerning the 'infinite absurdity' of the gravitation law as 'all guesswork,' but *demonstrations* overthrowing Newton's *mathematical demonstrations* of the law. That is what you need, and all you need, to publish in the February number.

"3. Are you fully aware that in denying the change of gravity as squared distance inverse, you are opposing the *whole* theory of *gravitation itself*, and proposing to leave us like the ancients in entire ignorance as to what causes the revolutions of the heavenly bodies? Thus to set aside Newton's supposed discovery of UNIVERSAL GRAVITATION would be the most stupendous overturn in science that the world has ever seen. It needs, not enthusiasm and rhetoric, but a cool head and very careful whispering, to venture on such a job. Bear with me if I suggest considerable modesty as fitting the endeavor. I should 'make haste slowly' in *publishing* on a mighty theme like this. Pray pardon the freedom of sixty-five years (no doubt to a junior), many of those years spent in long and laborious mathematical calculations, and important new deductions of an unpublished work on 'Gravitation and the Universe.'

"4. That you may see how little I have exaggerated under my last head, and how certainly your view would overturn *all* knowledge of gravitation whatever, allow me here to give a synopsis (or re-statement in my own way) of Newton's next step of demonstration, after that already given, establishing the center as the starting-point of calculation.

[Dr. Goodenow here gives a lengthy and correct mathematical statement of the manner in which the moon is kept in its orbit by the attraction of the earth, decreased as the square of the distance, and using the earth's radius of 4,000 miles as the unit.]

"These are not 'assumptions,' but *facts*, experimentally observed, and mathematically certain. And what follows from them? That *whatever* force keeps the moon in its orbit, by curving its motion from a straight line (and some centripetal force *must* do it), is a force drawing it downward toward the earth at a rate 3,600 times less than the weight or gravity of any body draws it downward at the earth's surface. If, therefore, it be *the same force of gravity* doing both, then gravity *must* and *does* decrease 3,600-fold from the earth's surface to the moon,—which is just the *inverse square* of the 60-fold by which the distance from the earth's center is increased. Thus simple and certain is Newton's initial demonstration of the gravitation law. You call it his 'assumed' law, 'all guess-work,' and 'infinitely absurd.' But candidly, is it so? Is it not as plain and as positive as the multiplication-table? All that Newton *assumes* or presumes at this stage is that the force at the moon, which acts just as weight acts at and above the earth indefinitely upward (where can it stop?) and which is certainly less there than weight is here in proportion to the inverse square of distance from the earth's center, is *probably* (why is it not?) the same force

of gravity here and there,—which may thus have sway through the heavens as a universal law.

"That this is indeed so, he proceeds to prove by the observed distances and times of revolution of all the heavenly bodies. These all so agree with and confirm and fix the law leading to all the triumphs of modern astronomical discovery (even in the location of new planets before they were ever seen), that, as Robinson (in his University Astronomy, p. 170) remarks, 'It is *impossible* it should be false.' I wish I could be as sure as to future destiny as I am of the gravitation law,—whose certainty *I know* as I know my own existence.

"Do not the *observed* values through the solar system show the accuracy of Kepler's Third Law?—that the squares of the times of the revolution of all planets are to each other as the cubes of their distances from the sun. And this being so, the centripetal force controlling them *has of necessity* to vary inversely as the square of distance, as a tyro in algebra by a few figures will show. Seeing that the whole process is a work of telescopic observation and mathematical demonstration, how can you say that this law is 'based upon *assumptions* which are contradicted by *observed facts*'? When you thus deny the law, you deny that what holds the moon in its orbit is the same gravity that makes the apple fall to the earth. You deny the whole principle of Universal Gravitation. You blot out the most sure and beautiful truth with which Science has enlightened the world. I beg of you, for the credit of your other work done, to pause and be sure you are right before you again lay your axe to the root of this tree.

"I think (what every astronomer would assure you at once) that you will find yourself mistaken in this matter of gravitation,—and yet you may be correct in the main issues of *your book*. I do not see the *necessity* of this point made by you, to the proof of your general doctrine, that all forces are of a *substantial* nature,—nor even its necessity to your view of *sound* and its variation of intensity. What though gravity does change as the square of distance inverse? It by no means follows that sound varies in the same ratio; for sound is a matter of animal *sensation*, which may affect its intensity, while gravity is an abstract value independent of sense. What though gravity force should be proved a *substance*? Would that prevent its operating as the inverse square of distance? Your attack upon the impregnable Gravitation Law seems to me a *needless* diversion of your forces, exposing your whole line to discomfiture. If you are correct on the leading feature of your book, *push that*.

"It is on that Problem of Human Life and Immortality that I am most of all engaged and interested as an investigator; and want all the light *you* can give.

"Wishing you success in your high aims, I am yours for the Truth,

"SMITH B. GOODENOW."

REPLY.

139 EAST EIGHTH STREET, }
NEW YORK, January 4, 1882. }

Dear Dr. Goodenow: I am in receipt of your second letter on gravitation, and thank you for

the kindly solicitude you manifest for my welfare. I feel that your advice, as well as your carefully argumentative reasoning, is purely unselfish, and aimed solely for my information, thereby to divert me from the commission of the fatal blunder which you honestly fear I am about to make. But while I am grateful for your solicitude, I regard you as laboring under a very serious misapprehension with reference to my views of gravitation. Allow me briefly to correct the mistake into which you have fallen. In the first place I believe as firmly as you do that gravity varies inversely *as the square of the distance* from any given atom of matter which sends out those mysterious rays toward any other given material atom. I am well aware also of the action of the earth's aggregate gravity upon the moon, and by which it is kept in its orbit, and that it is this manifest decrease of the earth's gravity, as the square of the distance by means of which astronomers are able to predict with mathematical certainty the movements of the planets and satellites, and even to point out the positions and motions of other planets in the heavens before they had been seen by human eye. All this I have long been aware of; and had you known it, you would have been saved the time and labor of so long an argument to convince me that the moon can only circle around the earth as she does, by the force of gravity diminished from the earth as the square of the distance between the two spheres. But what has this to do with my position, assumed in the December *Microcosm*, to which you have taken exceptions? Nothing at all. You really seem to suppose that I there deny this fundamental law of science, that gravity varies inversely as the square of the distance, atom acting upon atom, or sphere acting upon sphere. I say nothing of the kind in that article, nor anything you ought to have so construed. Yet you have hastily jumped to the conclusion that I denied, in effect, the mutual attractions of the spheres; and you have therefore gone on to picture the disastrous consequences of such an overturn to the beautiful science of the solar system. I feel that you have been altogether precipitate in this unceremonious leap into the heavens, and in not supposing the possibility of some mistake with reference to the earth's local attraction of bodies on its surface, as the square of the distance from its center, without necessarily involving in one eternal smash-up the system of gravity as it operates among the spheres. Let me tell you what I did say in that article, and what I now repeat with all emphasis, namely, that the assumption of the radius, or semi-diameter of the earth (4,000 miles) as the

proper unit of measure for calculating the ratio of the decrease of the earth's gravity from the center upon bodies at or near the surface, is pure guesswork and a self-evident absurdity; and I here assert that this will appear the moment the true facts in the case are pointed out. I go further, and say that Newton's 75th Proposition, as understood and explained by you, no doubt correctly, and as construed by all scientists,—that the earth attracts any body outside of it with a force diminished as the square of the distance from the center, or as if the whole attractive force of the earth (to use Newton's language) “issued from one single corpuscle placed in the center of this sphere,”—is a monstrous and self-contradictory error, and one of the most manifest and stupendous scientific fallacies ever laid down in a text-book. I pledge you to show in *The Microcosm* that the true law governing this decrease of the earth's attraction of bodies on or above its surface has been totally lost sight of by Newton, and that you have overlooked in your letters the essential facts and conditions governing the case. As startling and self-contradictory as this may seem to you, after my admissions, I here say that it will be demonstrated to the comprehension of a tyro in natural philosophy, and shown that if your error and Newton's, as to the local decrease of the earth's gravity upon bodies at or near its surface, extended from sphere to sphere, we would be as much in the dark as to what causes the moon to revolve about the earth as were the ancients; for then, verily, nothing but the miraculous hand of God could keep the moon in her orbit.

So you may relieve your mind as to all further anxiety about my disastrous mistake. I should regret to damage *The Microcosm* by publishing an irretrievable scientific fallacy vastly more than any one else. But I assure you I have no fears of ruining this paper by the exposition to be given of the ratio of decrease in gravitation, even in opposition to Sir Isaac Newton. I have not ruined nor hurt *The Microcosm* by assailing the current theory of sound, even as taught and advocated by the greatest living names in science—Tyndall, Helmholtz, and Mayer. On the contrary, some of the best mathematicians of the country have joined in its crusade against the wave-theory, and have instituted experiments for demonstrating in its columns that the fundamental law of decrease of sound-intensity as the square of the distance is totally false. Why, then, should I fear for the future of *The Microcosm*, by withholding my hand from assailing propositions laid down even by Newton, if I believe them to be erroneous? I am

well aware that this talk of assailing the laws and propositions of Newton's *Principia* sounds to you (who have accepted for more than forty years everything he has written on gravitation as infallible) like the ravings of a madman, since you say that you "know" that Newton is right with regard to this ratio of decrease in gravity with the same certainty that you "know" you exist. Hence you must, by the same token, "know" that I am crazy for calling in question any of his propositions. But I trust that when you have read my final argument upon this subject you will "know" that you have been laboring under a grievous mistake, and that you will then "know" it with the same certainty that you now "know" that you don't "know" anything of the kind. Hence, my dear brother, give yourself no further alarm, but wait for the developments of the future, when I shall expect the same *frank confession* from you that you now require of me as a condition upon which you promise to read my work. Kindly and fraternally yours,

A. WILFORD HALL.

WHAT CLERGYMEN THINK OF SCIENTISTS.

REV. DR. BANCROFT, one of the prominent Episcopal clergymen of Brooklyn, and a subscriber to *The Microcosm* from the commencement, made us a very pleasant call the other day, and said many things about the remarkable progress of our work that were highly gratifying to us. He was one of the earliest purchasers of *The Problem of Human Life*, and thinks it humiliating to the vaunted prowess of modern scientists that no one of the leading acousticians of the country is willing to risk his reputation by accepting the offer of *The Microcosm*, and attempting the defense of the wave-theory in its columns. He regards it as anything but a comfortable fix for Tyndall and Mayer to be in, thus publicly and continually to be cajoled and bantered and hired by an offer of \$5,000 to come to the rescue of the lost cause of wave-motion. But he thinks this one-sided warfare can not go on in this way much longer, without a desperate attempt on the part of one of those distinguished authorities to come to the front and save their reputation as scientists. Dr. Bancroft is one of those original thinkers in the Christian ministry who has no fear of science if it can only have a fair chance, and who believes in God's truth in the Book of Nature no less than in the Volume of Revelation. We fear, however, that he is doomed to disappointment so far as any hope is concerned of leading writers on sound ac-

cepting the offer in *The Microcosm*. Their policy seems to be silence, as if by concert of action. They no doubt know full well that the very first agitation of the question by an attempt on their part to defend the wave-theory, and their published treatises would cause an explosion in the scientific world that would shatter the foundations of that as well as other established theories, and involve their advocates and chief exponents in the general ruin. Hence masterly inactivity will no doubt continue to be their policy. We shall see.

THE PROBLEM OF THE SPINNING TOP.

SINCE the issue of the January number of this journal containing our solution of the above problem, we have received a number of letters from persons who had sent us answers, and who no doubt honestly thought them correct. Most of these writers are dissatisfied because their solutions were not accepted; and they insist they shall be published in full in *The Microcosm*, in order to do them justice, each one contending that his is the "only correct solution." Yet out of those who have thus complained there are four different solutions, involving entirely distinct and contradictory principles of philosophy. Each writer, however, is absolutely certain that his explanation is the correct one, and that all the rest are of course wrong. Now we would like to oblige these friends, one and all; but we assure them if we should publish even a tithe of the answers we have received, our paper would contain nothing but "solutions" for the next six months, which we fear our general readers might object to. We may, however, publish a supplement after a while to gratify those friends who are so sure they have struck it, unless in the meantime their view should become modified. We did not expect every one who wrote a long and elaborate solution to be satisfied with ours. The decisions of such interested parties are hardly apt to be as dispassionate as would be one from a scientific man who took no part in the competition. We have several of these, unconditionally indorsing our explanation as correct, one of which only we have room for at present. It is from the pen of Prof. Kephart, A. M., of Lebanon, Pa., for many years professor of physical science. We give it in his own words:—

"I have carefully examined your solution of the top-problem, and am well pleased with it. I regard it as strictly scientific, and in harmony with reason and common sense; and as being another incontrovertible proof of the correctness of your theory respecting the *substantial* character of all the forces. It is proof, too, wrenched from one of the very little things in Physics, and hence stamps its discoverer as standing in

the front rank of original thinkers; and further proves the correctness of my previous assertion, namely, that you are forcing educators out of the old beaten ruts of thought into new and original channels.

"Sincerely yours,

I. L. KEPHART.

"P. S.—Your calling attention also to the fact of the lowering of thunder-pitch as the distance from its source increases, is a sticker for the advocates of the wave-theory. This change of pitch is a *fact*, but it required a Wilford Hall to observe and call attention to it; and, to my mind, your manner of accounting for it is perfectly in accord with reason, and I am firmly of the opinion that future investigation will prove you to be right.

"I. L. K."

Equally strong is the indorsement of Prof. J. B. Bradley, A. M., professor of mathematics, astronomy, and physics, in the Christian University at Canton, Mo. He says: "Your solution of the top problem is a *complete success*," &c.

THE SUCCESS OF "THE MICROCOSM."

THE success of this journal is still the marvel of all who are acquainted with the facts. That from 1500 to 2,000 new subscribers a month are now regularly augmenting our list, and a majority of these clergymen of the various denominations can only be explained by the fact that *The Microcosm* has touched a popular chord that vibrates in sympathy with the blows struck in its columns at the claims of science, falsely so called. The book-publishers of this city, also, who refused to touch the manuscript of the revised *Problem of Human Life* unless the author would pay for the plates, declaring that they could never sell a hundred copies, are equally astonished and chagrined as they learn from our printers and binders that more than 25,000 copies have been manufactured and sold in less than 18 months; and that they are now being scattered far and wide, by mail and express, at the rate of about 2,000 copies a month! We are pleased, however, to acknowledge that we, too, have shared in the general surprise at the unexpected success of our efforts; and can only say, in return, "The Lord is my shepherd: I shall not want."

"REV.," "ELDER," "PASTOR," "D.D." &c.

WE receive many letters from ministers of different denominations, who send us their names as subscribers, but, out of a feeling of delicacy, without an intimation of their titles as pastors or clergymen. Brethren, why not let us know in some way that you are ministers of the Lord? A paper directed to "Rev. John Smith," or "Eld. James Brown," living in a city, for example, would be much more apt to

find him if he is a minister than if directed to plain "John Smith," or "James Brown." Then, besides, we want to know every minister, doctor, attorney, judge, or professor, who reads *The Microcosm*; and trust that the thousands now reading it will not allow a sentiment of delicacy to keep from us this valuable information by withholding their professional designation.

EXPLODED SCIENTIFIC THEORIES.

REV. DR. L. W. BATES, of Lynchburg, Va., and several other correspondents, have expressed a desire for a classified list of the exploded theories of science and philosophy in the past. We can not lay our hands upon the sources of information for collating such a list. Possibly some one of our readers may be able to do so. Such information would be valuable, and of interest to every reader of *The Microcosm*.

MICROCOSMIC DEBRIS.

At the village of Morita, in Echizen, Japan a field of 900 yards square was swallowed up during an earthquake and turned into a deep lake.

The new code of commercial laws for Italy, which has taken more than ten years to draw up, is finished, and has been presented to Parliament.

Leadville now numbers 20,000 people and fifteen out of Colorado's twenty-three millions' worth of ore mined last year were from the Leadville district.

Magnificent pine forests have lately been discovered on the upper waters of the Saskatchewan, and explorers have traced them fifty miles up the shoulder of the Rocky Mountains.

Prof. Sumner, of Yale, says that the present college fashion is to "teach a bit of Latin, a bit of Greek, a bit of biology, and a bit of something else, so that in the result men hardly know anything."

A "ladies' four" has lately been seen on the river at Oxford, in England, manned (or rather womanned) by students of the High School. Among the fair crew is the daughter of one of the professors.

The sum of \$1,000 damages has just been awarded by a western court to a man who caught cold while riding in an emigrant car, when, as he claimed, he was entitled by his ticket to a seat in a parlor car.

The finest railroad-station in the United States is said to be the new one of the Pennsylvania Company at Philadelphia. It stands in

the heart of the city, and is described as a "magnificent specimen of gothic architecture."

Of 254 samples of victuals lately analyzed by the Berlin authorities, forty-four proved adulterated. Green tea was dyed and mixed with flowers of hay, cocoa with potato and corn flour. There will be more rigorous penalties.

It has been decided that the dome of the colossal Palais de Justice, in Brussels, now approaching completion, which was to have been of copper, shall now be constructed of papier-mache. It will weigh about sixteen tons.

The Mountain of the Lord, is a solid rock, 100 feet in height, rising above the street level at Manti, Utah. The Mormons are building on this eminence a temple of fine marble, 95 feet by 170 in area, and handsomely adorned.

Mr. Longfellow kept Thanksgiving Day by reading to a friend a poem he has recently composed, called "Hermes Trismegistus." He has been, and still is, suffering from attacks of vertigo, which have confined him to the house.

Silk-culture in Louisiana has of late become a thriving industry, and to-day promises an abundant production. The mulberry-trees have escaped injury by frost, and the silkworms are increasing in quality and numbers handsomely.

In some parts of Europe the Baptists have found large success in their missionary and evangelical work. Not so, however, in Leipsic. There no child is allowed to enter the public schools without a certificate of having been baptized in infancy.

A bog near Garry Castle, County Westmeath, in Ireland, has, in consequence of recent floods, been moved a considerable distance seaward, and a railway gatekeeper's house standing upon it, which formerly fronted the line, has been turned half round.

Pennsylvania has a law requiring that bequests for religious purposes must be made, to be valid, not less than thirty days before death. A Philadelphia court has decided that a provision in a will to fit a young man for the ministry is, under this act, invalid.

A single vineyard near Dixon, Solano County, California, has just yielded 250,000 boxes of raisins, worth \$500,000. Vine-planting is increasing greatly throughout the State, 2,000 acres of new vines being about to be set in the neighborhood of Cloverdale alone.

Professor Phelps, of Andover, does not like weeping clergymen. "In a public speaker," he says, "tears are an infirmity to be got rid of, never a gift to be vain of. My advice to

weeping clergymen is to use tonics; study mathematics; take fresh air; take to the saddle."

The silk trade of Lyons now occupies some 120,000 looms, of which only 30,000 are within the city. Including those who work in the silkworm establishments there are 800,000 persons employed in the Lyons silk-trade. In 1787 there were but 80,000, and 18,000 looms.

According to Chief Justice Prince, New Mexico has more gold than California, and more silver than Colorado. Humboldt predicted that the mineral wealth of the world would be found to lie in Arizona and New Mexico, and it is believed that the time for testing the truth of this opinion has about arrived.

Jenny Lind is represented as gracious and helpful to American girls who are studying music abroad and seek her counsel; but she advises them to return to America for training and employment, both of which she thinks can be better obtained here than in Europe where the field is overcrowded.

The steamers started on the Grand Canal of Venice by the enterprise of a French company are not, it seems, attracting much custom. All well-to-do Venetians have gondolas of their own, and the steam craft carry at each trip only a poor half dozen of Austrian priests, tourists, and other despicable folk.

The eucalyptus planted near Mentone in 1859 had a height of fifty feet and a diameter of forty inches at three feet from the ground in 1874. It is strange that a tree which has such marvelous absorptive powers should be the special product of the driest of countries,—its chief original home being, it seems, Australia.

A few days ago a large meteoric stone, which seemed to come from a point in the Hautler directly over the mountains on the Savoyard side of the Laste, fell with a tremendous report in the market-place of Vevay, in Switzerland. It was sufficiently large to have crushed any house upon which it may have chanced to alight.

Since 1865 Tennessee has acquired nearly 400,000 additional population, and has made crops every year of an average annual net profit of \$27,500,000. Since 1860 Memphis, in spite of the war and three epidemics, has grown from 23,000 to 47,000, while Nashville has crept up from 17,000 population to 75,000. The growth of Chattanooga, Knoxville, and other towns has been at proportionate rates.

A combined effort is being made by sportsmen in Massachusetts to increase the feathered

game in the western part of the State. Large quantities of wild rice have been planted; wild celery has been placed in the rivers and ponds for ducks to feed upon, and 500 young quail have been let loose on fields previously prepared for them.

A collection of importance to Oriental scholars, consisting of 5,400 cuneiform tablets, is now on its way to England. These were discovered by Mr. Rassam at Sephara, near Babylon. It is supposed that these tablets are the library mentioned by Besosns, which contained antediluvian records copied from earlier documents about 1800 B. C.

The Rev. Dr. Speer, who many years ago was a missionary in China, is laboring among the Chinese in Chicago. Possessing the happy faculty of being able to preach to these people in their own language, he holds a meeting with them every Sunday in Farwell Hall. He has secured their respect and confidence, and seems to be doing them good.

Earthquakes, volcanoes, and tornadoes have all been hard at work destroying the habitations of men this year. Now glaciers are adding their efforts in the same direction, the complete annihilation of the Swiss village of Elm, by a neighboring peak, being pronounced only a question of time and bad weather. Yet Elm is more fortunate than Agram and New Ulm in having ample warning.

A curious question of criminal law has just been raised in Berlin. A young woman, who is a confirmed opium-eater, for the purpose of obtaining a supply of morphine, copied a prescription from a medical book and signed the name of a prominent German physician to it. The question now to be determined by the courts is whether this act constitutes the crime of forgery, for which she has been arraigned.

The famous big trees of California, 350 to 400 feet high, and proportionately thick, are on public land, subject to entry at \$1.20 an acre, and may be bought up and destroyed by whoever wishes to make such use of them. The bark has already been peeled from the butt of one for a showman, who sets it up at fairs as an exhibition, and another has been cut down in order to make a dancing platform of the stump.

Denver is one of the wonderful growths of the West. In ten years it has become a city of 45,000 people, and most of this has been gained within the last five years. In 1876 its real estate would hardly sell for taxes, while now desirable business sites bring \$250 to \$300 per front foot. Many of the new structures are elaborate and handsome,—notably an opera-

house costing \$700,000, a union depot, and an Episcopal cathedral.

Recently published statistics show that the consumption of tobacco in France has largely and steadily increased during the present century. In 1815 the amount derived by the State from this one article was 32,172,000 francs. In 1853 the amount had risen to 193,000,000 francs, while in the latest return given it was 313,546,000 francs. This represents an average of about nine francs per head of the population.

In a report on the forests of British Columbia, Professor Dawson, of the Geological Survey of Canada, dwells upon the importance of the timber trade of the Dominion. The Douglas fir, or Oregon pine, is the most valuable tree he refers to. It is often more than eight feet in diameter, and from 200 to 300 feet high, forming dense forests. The Western hemlock and red cedar are next in importance, and grow to a great size.

Among the remarkable novelties of recent discovery is the shoeblack-plant, a native of Australia. The leaves of this shrub contain a tough substance gifted with all the properties and attributes of the finest shoeblackening. Squeeze them gently, and they will yield some thick, dusky drops of sticky fluid, which, if spread over the surface of the shoe, a polish of dazzling brilliancy may be brought out by a few light touches of the polishing-brush.

M. Paul Bert has been experimenting in the dissecting-room of the Jardin des Plantes, Paris, on the respiratory organs of some crocodiles which were recently sent him as a present. He gave their flesh to some of the servants in the menagerie, recommending them to cook and eat it. They did so, and "found that crocodile flesh is tender, delicate, appetizing, and like both salmon and lobster. It has, however, a slight taste of musk."

Paul H. Hayne was wealthy before the war, but now he is very poor, and too ill to work. His residence is little more than a hut, standing alone in a clump of scrub oak on a sandy knoll, twenty miles from Atlanta, Ga. The commonest necessities of life are all that he can procure; but he goes on rhyming, in a room papered with pictures cut from illustrated papers, and on a desk made out of an old workbench left on the premises by a carpenter.

At the estate in England known as "Elvedon," owned by an Indian Prince, who is an enthusiastic sportsman, there are 140 acres of woods and meadows, inclosed by a wire fence ten feet high, devoted to breeding pheasants. Six thousand birds form the breeding stock,

and at the height of the laying season 2,000 eggs are picked up in a day. These are sold all over the country, and Elvedon eggs are the most sought for by other gentlemen who rear pheasants.

Chicago handles about one-third of the entire forest products of the vast pineries of the northwest. Millions of acres of timber-lands in Michigan, Wisconsin, Minnesota, Iowa, and Illinois, are tributary to her market. The entire product of these pineries last year in manufactured lumber amounted to about 5,750,000,000 feet, and, according to the best estimates at this date, the production for the present year will show an excess of at least twelve per cent.

The richest person to-day upon the Sandwich Islands is Claus Spreckles, of Honolulu. A few years ago he was laughed at when he purchased 10,000 acres of land for ten cents an acre, as the tract was at the foot of an extinct volcano, and covered with a crust on the surface like a flagstone walk. He broke up this crust, mixed the dust with a small quantity of vegetable mold, thoroughly irrigated the soil thus formed, and planted sugar-cane. To-day he is a millionaire.

The late census of Japan shows a total population of very nearly 36,000,000. The Mikado and his family are shown at the head of the statistics as twenty men and seventeen women. Yeddo, of the vastness of which the old geographers used to tell such tales, contains only 957,121 inhabitants. Kioto approaches it closely with 822,098, and Ozaka comes next with 582,668. Males are more numerous than females in the proportion of 28 per 1000,—that is, there are 1028 men for every 1000 women.

Energetic measures against the locusts are being taken in Cyprus. Up to the end of October, 880 tons of their eggs had been destroyed, of which 280 tons were gathered in that month alone, and four or five months still remain for the collection. The rewards paid have been raised to £13 the tub; and the government, having already spent £6,000 this year on the eggs, is preparing to expend £23,000 as soon as the insects are hatched in April and May on screened enclosures and pit traps to be managed by 2,000 men.

Before the civil war the exports of pecan nuts from Indianola, Texas, were reported at \$100,000; now it is estimated that the amount annually gathered exceeds \$200,000 in value. No care, however, has been taken of the trees; in fact, in many localities trees fifty to one hundred years old have been cut down to secure the nuts. With proper care of the trees and systematic gathering of the crop it is believed

that \$10,000,000 could be annually realized. Mexicans and negroes are the most numerous pecan gatherers.

A writer on the "Golden Age of Australia," in the last *British Quarterly Review*, says: "This brilliant epoch has already come to an end, although it will long bear fruits. The yield has for many years been declining. Gold-production still remains, but its glamor and glory are gone. The golden age proper—the period when gold-finding not merely yielded its peerless and romantic harvests of wealth, but presented its socially and economically peculiar features—lasted in Australia, as in California, barely half a dozen years.

California papers say that the phylloxera panic, which threatened at one time to put an end to vine-growing in the Golden State, and which had done so much harm in Europe, is a thing of the past. It has been found that this enemy of the vine can be controlled, if not extirpated, by the use of proper remedies, and the dread of it is dying out. Most of the vineyards in Sonoma Valley are now in a flourishing condition, as many new acres have been planted this year as in the last three combined, and the yield promises to be enormous.

Count Kalnoky, the new Austro-Hungarian Foreign Secretary, is among the youngest of the statesmen of Europe. Prince Bismarck is 58, Mr. Gladstone 72, and Prince Gortchakoff 83. Count Kalnoky was born in 1832, and is of the same age as Count Ignatieff. He is six years older than M. Gambetta, and seven years younger than Count Andrassy. Like most of the men who are now in power in Europe, always excepting M. Gambetta, his birthplace must be sought near the northern boundary of the empire over which he presides.

In Japan the Buddhists are becoming alarmed at the spread of the Christian religion, and have attempted to bring business methods to bear on it in such a way as to prevent it from making converts of their followers. They now lend money to persons who want to engage in business, the loan being conditioned on the borrower remaining a Buddhist. The effect is reported as being somewhat similar to that of the enterprising Sunday-school superintendents in this country, who give children chromos and other valuable merchandise as inducements to come to Sunday-school.

The increase in the number of whales is becoming noteworthy. Frequently we hear of the huge monsters getting in the pathway of sailing vessels, and breaking propellers or paddle-wheels. For all this coal-oil is responsible. It is so much easier to sink a well than to fit out a whaler that sperm-oil has been re-

placed by kerosene. It is so much less expensive to make springs in shops than to harpoon whales that steel and celluloid have taken the place of whalebone long ago in umbrellas and corsets. Meanwhile the sportive whales go on marrying and replenishing the seas until their numbers are becoming formidable.

Mrs. Mauzal, an English woman, has lived four years in Portland, Oregon, and in that time has managed to acquire a great deal of knowledge about the private lives of Portland people. Lately a fortune-teller, calling herself Madame Lourmande, put out a sign in the city, and was soon doing an enormous business, because, though professedly a stranger, she was able to surprise her callers with remarks about their private affairs. This went on until somebody discovered that she was none other than Mrs. Mauzal, transformed into an old French hag by means of a wig, painted wrinkles, the removal of false teeth, and a foreign accent.

An attendant at the telephone-station in the Rue du Bac, in Paris, recently opened communications with another station, and was awaiting a reply, when a volume of flame and smoke issued from the tube connecting the wires. The fire quickly spread to the walls of the room, and was not extinguished until considerable damage had been done and several sets of apparatus destroyed. On the matter being investigated it was found that a workman in a sewer under the Boulevard St. Germain had accidentally burst open a gaspipe and so set fire to the inflammable covering of the telephone-wires running alongside. The flames spread rapidly, thus reaching the office in the Rue du Bac.

The Municipality of Granada, in Spain, is soliciting Government aid in the establishment of a magnificent School of Fine Art, which is to carry out a cherished project of Fortuny's. Fortuny, who drew so much of his inspiration from the loveliness of Granada, was always of opinion that the city of Alhambra ought to be made the center and home of Spanish art. Nowhere else could a Spanish artist obtain a training so racy of the soil, and no other town, in the great painter's opinion, united so many advantages for artistic study, combining, as it does, beauties of hill, plain, and architecture in an extraordinary degree. It ought to be made, he used to say, the Rome of the Spanish art student.

The old reputation of India as "the sink of the precious metals" appears, from an official paper recently published in Calcutta, to be well maintained, notwithstanding the decline in the net imports of silver. It seems that the

net imports of the precious metals during the last twenty-five years,—that is, the amount after deducting the quantities exported—have reached the enormous sum of 285½ millions sterling (\$1,565,000,000). Last year the registered imports of gold were nearly eighty per cent. greater than in the previous year, and the largest of any year since 1870-1. This is considered to indicate a return of prosperity, and a consequent increased demand among the people for hoarding and for ornaments.

The process of casting the new big bell for St. Paul's Cathedral, in London, has now been completed at the foundry of M. Taylor & Sons, of Loughborough, Leicestershire. The preparations had occupied many months. The new bell being the largest in the kingdom, an additional furnace had to be erected, three being required for the purpose. About twenty-one tons of metal were prepared, and this, on being permitted to issue, occupied about four minutes and three-quarters in filling the huge mold. On November 26th the enormous casting was in process of cooling down. On being dug out it will weigh no less than seventeen and a half tons. The Midland Railway Company has declined to transport the ponderous load to the metropolis, and it will accordingly have to be conveyed by road.

An inventory of the property in Paris belonging to the city estimates the total value at \$201,200,000, the principal items in the inventory being the newly constructed Hotel de Ville, the twenty town halls, one to each arrondissement; sixty-four Roman Catholic churches, nine Protestant churches, and two synagogues; thirty-nine incumbents' houses, the public funeral establishment, nine higher and secondary schools, 143 primary schools, three theaters, twenty barracks, three halls and markets, 145 octroi buildings, nineteen cemeteries, forty-four parks, squares, and nursery gardens, ninety-six statues and fountains, and eighty-eight capals and depots.

Professor Donders, long known as the most distinguished oculist in Holland, recently delivered a lecture in Amsterdam on color, which has been widely quoted. After an elaborate experimental analysis of various popular notions on the subject in hand, Professor D. proceeded to demonstrate that, notwithstanding the prevailing theory, green must be ranked with the primitive colors, like red, blue, and yellow. Green, the Professor explained, could not be produced by mixing pure yellow and blue; such a composition would be white, in the very nature of things. The green color, which is apparently derived from the amalgamation of two paints, is, in reality, says Professor D., the result of "subtraction."

In France a pearl costing sixteen dollars is now imitated for fifty cents or a dollar, and so successfully as to be sold at the price of the genuine article to any one not a veritable expert, and even the latter class are often puzzled. The artificial pearl, however, is simply a glass bead or globe, which is first coated on the inside with a glue made of parchment, then treated with a peculiar so-called "essence," after which it is filled with wax. The essence is the chief pearly ingredient, and is obtained by rubbing together white fish so as to remove the scales; the whole is then strained through linen and left to deposit its sediment, which is the "essence" in question. It requires about 17,000 fish to produce a pound of the pearly essence.

An examination of the delta of the Mississippi shows that, for the distance of about three hundred miles of this deposit, there are buried forests of large trees, one over the other, with interspaces of sand. Ten distinct forest growths of this nature have been observed, which must have succeeded one another. These trees are the bald cypress of the Southern States. Some have been observed over five feet in diameter, and one contained 5,700 annual rings. In some instances, too, these huge trees have grown over the stumps of others equally large. From these facts geologists have assumed the antiquity of each forest growth at ten thousand years, or one hundred thousand for the whole. This estimate, however, would not include the interval of time—which doubtless was very considerable—that elapsed between the ending of these vast and wonderful forests and the beginning of another.

A well-known German manufacturer of mica wares, Herr Raphael, of Breslau, now makes mica masks for the face, which are quite transparent, very light, and affected neither by heat nor by acids. They afford good protection to all workmen who are liable to be injured by heat, dust, or noxious vapors, all workers with fire, metal, and glassmelters, stone-masons, &c. In all kinds of grinding and polishing work the flying fragments rebound from the arched mica plates of the mask without injuring them. These plates are fixed in a metallic frame, which is well isolated by means of asbestos, so as not to be attacked by heat or acid. Where the mask has to be worn long it is found desirable to add a caoutchouc tube, with mouth-piece, for admission of fresh air; the tube passes out to the shoulders, where its funnel-shaped end (sometimes holding a moistened sponge) is supported.

A writer in a West Virginia paper says that the Shenandoah Valley, when first settled, 160

years ago, was an open prairie-like region, covered with tall grass, on which herds of deer, buffalo, and elk fed, and devoid of timber except on occasional ridges; but that after it became settled trees sprang up almost as thickly and regularly as if seed had been planted. These forests, having been preserved by the farmers, cover now a large part of the surface of the valley with hard wood trees of superior excellence. The explanation of the change is that previous to the settlement of the valley annual fires, negligently started by Indians, burned up the young trees, and prevented the formation of forests, but with the arrival of settlers these fires were prevented; and the opinion is asserted that the treeless character of the western prairies is owing to the Indian practice of annually burning the grass. Were it not for that, dense forests would have covered the vast plains for centuries.

Within a bow-shot of the great town gate of Morat, in Switzerland, stands a venerable oak more than five hundred years old. It was a full-grown tree on the eve of the famous battle of Morat, when Charles the Bold held conference with his generals under the shade of its wide-spreading branches. Twenty-four hours later the leaders of the Swiss gathered round this selfsame tree, and offered up thanks to heaven for their signal victory. They despatched a messenger to Freiburg with the tidings; and, in conformity with a foregone arrangement, confided him a token by which the Federalists of that city might recognize him as a duly accredited envoy. This token was a leafy branch, cut from the oak in question. Its bearer put forth such speed in executing his mission, that when he reached Freiburg he had but just strength enough left to gasp out his message, and then dropped dead on the ground grasping the oak branch to the last. He was buried where he fell, and the branch planted on his grave, is at present one of the largest and stateliest trees in Europe, having completed its four hundred and fifth year.

THE SPIRIT-LIFE OF MAN.

BY PROF. I. L. KEPHART, A.M.

REASON and observation declare the duality of the *genus homo*. He has a flesh-life and a spirit-life,—a dust-existence and a sentiment-existence: a perishable, organic body; and an imperishable, indestructible soul. For the transitory, perishable body, exists this transient, perishable world; and by parity of reasoning, mankind conclude that for the soul there exists a spirit-realm that is in every way the opposite of this mutable, visible sphere. In

this body-kingdom, the indulging, grasping, appropriating passions of the material nature, aspire to reign and bring all things into subjection to their demands. But beneath this pile of rubbish, this debris of an overthrown noble structure, there wells up the grand aspirations of the spirit-life, struggling to throw off the filth and carnality that hold it down, and endeavoring to reach out after a higher and a better existence, and to rise to a more intimate acquaintance with God, and to a fuller development of the sentiments of charity, friendship, righteousness, and benevolence,—sentiments not natural to the flesh, but constituting the being and life of the soul, in the sense of our spiritual entity.

Reason and observation declare that the material world and the material body are mutable,—that they must dissolve, must pass away; and with their dissolution must be snuffed out all the affections based wholly upon them. The love that attaches only to carnal things must perish when they perish. The aspirations that rise no higher than earthly treasures must cease to exist when they are consumed. The joy of possession that has its source only in perishable objects, can no longer exist when those objects are no more. All these passions of the human heart, having their origin in earthly things and springing from the soil of material existence as plants of the tropics spring, must go down to dust again, even as those plants go down. They, of necessity, and from the very nature of things, have no enduring qualities. With “the wreck of matter and the crash of worlds,” they must perish forever.

But there is a spirit-life which is over and above the flesh-life, and possesses none of the perishable qualities of it. This spirit-life is a life purified and elevated above carnal things. It is a life permeated by righteousness, pervaded by an ennobling, elevating sentiment of love to God and man. He who possesses this spirit-life is regulated in all his acts by “the law of the spirit of life in Christ Jesus,” which lifts him into the higher atmosphere of God’s mercy and goodness, thus enlarging and ennobling the man and giving his life and his being a grander breadth, and a more profound and enduring depth. Howard, Wilberforce, Dr. Samuel G. Howe, Florence Nightingale, Elizabeth Fry, and Mrs. Fish in their disinterested devotion to the amelioration of the sufferings of humanity, were striking illustrations of its reality and power. Instead of such a life being narrow and bigoted, it is broad and liberal; instead of its being superstitious and ignorant, it is full of faith, reason, and brilliancy. Treating the material carnal things of

earth as unworthy of its supreme affection,—as only temporary helps to a better existence,—it reaches out after the spiritual and imperishable realities of the spirit-realm.

This spirit-life rises superior to all the degrading passions of the flesh-life. Under its influence the man becomes “a new creature in Christ Jesus.” Intemperance, ignorance, idleness, barbarity, all disappear; and in their stead are found meekness, temperance, virtue, knowledge, brotherly kindness, charity, hope, peace and joy, in the Holy Ghost. Rising above the material and gross pleasures and passions of earth, it enables its possessor to make a proper use of earthly existence and earthly possessions and passions. Instead of permitting them to control and enslave the man, they are all curbed, governed, and controlled, by the spirit-life as servants whose business it is to minister to the higher nature.

The more of this spirit-life there is in a man, the better it is for that man; the more of it there is in a community, the better it is for that community; the more of it there is in a nation, the better it is for that nation. Orthodox theologians may exhaust the resources of logic and rhetoric in their word-battles with materialistic atheism; Christian scientists may hurl their stubborn *facts* of science against the theories of Haeckel, Huxley, Vogt, and Spencer; but in addition to these all-important and indispensable defenses of Christian theism, the world needs a constant irrefutable demonstration of the *reality* of spirit-life. Keep constantly before its assembled gaze the great *fact* of men and women living on the high moral plane of truth and duty as inculcated by the despised Nazarene, and the equally important and undeniable fact that their so living makes the world, by that much, a more desirable place to live in, and modern materialism will have left but little power for evil.

The theologian, with his logic and ethics; the Christian scientist, with his *facts* culled from the laboratory of Nature; and the incontrovertible argument of a holy life, enthusiastically devoted to the best interests of humanity and tempered with reason and judgment, constitute the “the threefold cord, not easily broken,” that binds the conscience of man to a firm belief of the doctrines of Christianity. They are the three witnesses by whose testimony every word is being established.

While the pulpit is thundering from God’s word against atheistic materialism, and *The Microcosm* is dealing out from the laboratory of scientific investigation its sledge-hammer *facts*, upsetting the false theories of skeptical, self-opinionated scientists, let all lovers of truth seek more earnestly than ever to hurl

into the teeth of modern infidelity that other and most powerful missile—the unanswerable argument of an upright life, devoted to the lifting of humanity into a higher plane of truth and duty.

SEPARATENESS OF SOUL AND SPIRIT.

BY ELDER C. S. TOWNE.

DEATH demonstrates the separateness of mind and matter. In sleep our dreams make certain the personality of the separated mind. This question then presents itself: is the separated mind simply a soul or spirit: or is it a soul and spirit? Is there any fact of universal occurrence testifying that the invisible personality is soul and spirit? I answer that the voice of conscience struggling against the determinations of Will is such a fact. Every person, whether he be able to classify and locate his faculties or not, is conscious at times of two antagonistic forces within himself. Something within wishes or purposes to do a certain act. Something else within says he ought not, because the act is wrong. Yet, in spite of this inner protest, something resolves to do the act, and says, "I will." And while the determined Will is engaged in carrying out the action, something else within is striving to arrest the action known or thought to be wrong. It is often the case that a man will drink deep of the drunkard's glass to drown or stupify this accusing voice, that he may do his murderous work the more surely. "I ought," and "I will;" or, "I ought," but "I will not;" "I ought not," and "I will not;" or "I ought not," but "I will," are facts of internal concurrent (or else antagonistic) action universally acknowledged, and constitute the first proof in the chain of argument demonstrating the dual nature of the separable and unseen personality of every man. As I can not cause my body to go in opposite directions at the same time, so we cannot suppose that *one* internal and substantial entity should be striving and acting in opposite directions,—for the right and against it, at the same time. But how shall we draw the dividing-line between soul and spirit? We can not present them to the observation of eyesight, and say, "Here stands the soul, and there stands the spirit; and there again they stand united." The Bible says: "The word of God is quick and powerful, and sharper than any two-edged sword, piercing even to the dividing asunder of soul and spirit, and of the joints and marrow," &c. They can not be mechanically separated. Spoken words alone can separate them, by showing their different attributes or facul-

ties as always working in two groups. Among the summaries of my first article I said that the primary property of soul was to decide motion; the property of spirit to guide motion. Let us notice the difference between guiding and deciding. The spirit or conscience may say, "I ought to do this act," but it has not the power to use the nervous telegraph setting the muscles in motion to execute the act. The soul alone possesses this power: it decides to move or not to move. If the will decides not to move, every man knows that all the inward admonitions of conscience avail nothing to accomplish the action. We see in man various forms of action called faculties or attributes, viz.: Perception, understanding, reason, imagination, discrimination, memory, choice, will, emotions, feelings, or passions. Where shall we draw among these the dividing-line between soul and spirit? When we look more narrowly at the actions of these faculties, we see that there are two centers of action—the head and the breast. To illustrate. Men talk of a religion of the head, which is not one of the heart. In this head-religion we find that the faculties of perception, understanding, reason, imagination, memory, and discrimination are actively engaged. The person sees the truth and gives assent to it; discriminates between right and wrong, and admits the obligations resting upon him to do right. So far as the head is concerned, he is all right. But there is no feeling of hatred of sin, and love of righteousness emanating from the breast; no determination of the will springing from the heart, to do that which reasoning conscience says he ought to do. Here we see that the influences that guide or point out motion, have their center of action in the head; but the power which decides and controls motion, has its center of action in the breast. This brings us to another proof in the line of argument, establishing the dual nature of mind. In the conflict of right and wrong between conscience and will, the dividing-line always falls between these two groups of faculties. In the action of the head group we see and understand the nature of a wrong action. Reason passes judgment as to the course we should pursue. Imagination, with the aid of memory, points out the possible consequences that may result from the wrong-doing, while discrimination contrasts the right with the wrong in order that an intelligent choice may be made. All these faculties concur in condemning the wrong action. But in the action of the second or heart group, and against the action of the first, we deliberately choose the wrong. The feelings are ranged upon the side of wrong; we love it for some fancied good we

think we see in it, and the will determines to act accordingly. The conflict is always between the two groups, and not between the different faculties of one group. If we see and understand a wrong, reason will never say "do the wrong." If we love the right, the will never chooses the wrong. These facts point with a steady finger to the existence within us of two natures—an intellectual spirit, and a feeling, willing soul.

The spirit-group constitutes the spiritual nature of man. Its action embraces the whole range of science—mathematical, physical, and religious. The supreme action of the spirit is faith. The soul-group constitutes the psychical nature of man. Its powers embrace all overt action of every kind whatever, either right or wrong. The supreme action of the soul is love. In religion, the action of the spirit embraces the science or knowledge of religion. The action of the soul embraces the doing of religion. The body or physical nature of man is the passive instrument through which soul and spirit work. I have not space here to enlarge upon the joint action of soul and spirit and their relations to each other.

The spirit by faith receives and holds the law of right and wrong, and impresses its obligations at all times upon our attention. The soul is the executive power to carry out this law in overt action, or to break it. The human spirit may err, but it is the soul that sins. When the soul sins ignorantly, the spirit is in the state of error; but in willful sin the soul refuses to obey the truth pointed out by the spirit. Conscience is simply an educated spirit.

In the newborn child the spiritual nature is dormant, like the life-germ in the seed. The infinite expansions of its eternal future are folded in the beginning consciousness of the infant like the giant oak in the sprouting acorn. All external influences are to the spirit an education, or leading out, in truth or in error. If the influences and ideas which have educated the spirit are good and true, then the voice of conscience is to us the voice of God: otherwise *it is not!* All our sources of primary education are so few and imperfect, that there is always more or less danger of deception, even in that which is wholly unintentional. Hence, the voice of conscience can never be relied on as infallible. The spoken and written revelations of our divine and all-wise Educator alone can be to us a sure guide in truth and right. But in one thing conscience is unfailingly sure: it always stands upon the side of right, or supposed right.

Hence, in the domain of the soul there never need be the slightest hesitation in deciding

upon the course of action, when truth is seen and understood. The spirit will never fail to say, "I, you, he, ought to do right." In all the crooked paths of the soul's sinning the voice of the spirit ever sounds in the inner hearing, the admonitions of right, the condemnations of wrong, and the premonitions of coming judgment and retribution. When I come to speak of the properties of soul and spirit as substantial existences, other proofs will be developed, showing the differences between them in a striking manner. Still more emphatic will the difference be made in unfolding the correlations between the divine and the human; in explaining the related action passing from one to the other, and in the setting forth of the scientific certainty of unending punishment.

THE MYSTERIES OF THE BIBLE.

BY REV. J. J. SMITH, D.D.

ONE of the most absurd and foolish objections to the Bible as a Divine Revelation is the charge made by a certain class of skeptics that it is filled with perplexing and unfathomable mysteries; that its doctrines, to a very great extent, are incomprehensible by man, to whom they are professedly sent as the revealed will of God; and, therefore, they allege, they bear upon their own pages the evidence of their spurious character.

That the Bible contains mysteries, we most freely admit. Paul says, "Great is the mystery of godliness," &c. But that it therefore follows that it is not inspired, we as firmly deny. A book that seeks to unfold the character and attributes of God the compound nature of man; his relations, accountability, possibilities, and destiny; the great plan of human redemption; the ministration of angels; the resurrection of the dead; the judgment of the last day, &c., &c., must necessarily contain many mysteries. Take, for instance, the enunciation that "God is a spirit." How can even this definition be otherwise than a mystery? Who can form a definite idea of a being purely spiritual, but especially to comprehend the Infinite? If man could in his mind grasp the God of the Bible so as to comprehend Him, it would prove God to be no greater than man. It is shallow waters that are readily fathomed, and low objects that are easily reached.

This want of ability to comprehend all the truths of the Bible, is by no means exceptional and confined to scriptural theology. There are innumerable mysteries in the scientific world. Consequently, the speculations and theories of the best-cultivated minds respecting the origin

of matter, the formation of worlds, and their final destiny, are wonderfully divided. How much mystery is locked up in our planetary system? But what is this to that contained in the thousands of clusters of self-luminous suns, which in their aggregation are numbered by hundreds of millions, that twinkle in the distance? The mind is utterly unable to comprehend such magnitudes, distances, forces, and velocities, as are presented by astronomers in reference to even our own system.

In fact, the whole universe is full of mystery. Most of the various and multitudinous operations of Nature are to us incomprehensible. Look at ourselves; what mysterious processes in the digestion of our food, in the separation of the chyle, in the circulation of the blood, in its transformation into bones, ligaments, tendons, muscles, membranes, arteries, nerves, tissues, brains, &c. How mysterious the phenomena of the intellect, the union between mind and matter, the connection between the will and the brain, &c. Man, with all his boasted wisdom, knows but little or nothing of the secret springs of the complicated machinery within him.

Nor is mystery confined to the higher forms of universal organizations. No matter how low we descend down the scale of animal existence, mystery surrounds us at every step. The radiates, rhizopods, protozoans, or monera, are as great a puzzle to Darwin, Haeckel, and Huxley, as are the more perfect forms of organic life. No one, on merely scientific principles, can analyze and explain these hidden vital forces.

Even in the vegetable kingdom we see forms, and processes, and vitality, that are as incomprehensible to us as they are manifest and numerous. Who can understand and analyze the mysterious forces in Nature's great laboratory among plants? How amazing the processes by which the roots, trunks, branches, bark, and leaves are formed! How wonderful the complicated system of arteries and veins, &c. How strange that from the decomposition and decay of seeds that life and vitality are born! That from filthy coils, and muddy waters, and offensive impurity, vegetable forms of exquisite beauty and fragrant flowers of untold sweetness come to cheer and gladden our hearts!

Now, if we are continually surrounded with mystery in the material world,—if the animal, vegetable, and mineral kingdoms are full of the unknown,—if we are beset with difficulties in all our scientific pursuits, in every field of investigation,—where is the reason or consistency in rejecting the Bible because it contains mysteries?—and especially in view of the fact,

that its great leading truths are deeper, broader, higher, and far more sublime, than are mere physical phenomena?

THE IMMORTALITY OF ANIMALS.

BY THOMAS MUNNELL, A.M.

THIS would be a question of little concern to us, were it not that many arguments, apparently deduced from science and philosophy, for the immortality of man, seem to apply just as well to the immortality of animals: and as an important bill in Congress may be killed by putting a heavy "rider" upon it, so materialists would kill our hope of heaven by trying to saddle it with a load it may not wish to bear. We would not affirm that animal existence hereafter would necessarily, or at all, interfere with our future happiness, for this we do not know; but we deny that philosophy must keep still for fear of this unwelcome rider. This piece of materialistic stratagem receives most of its strength from the many points of similarity between men and animals, as discovered in comparative anatomy and in the regular gradations of the highest forms of animals up toward the lowest forms of men. But the fact that animal and human life edge up so nearly to each other, no more proves them to be of the same nature than the fact that land and water edge up to each other proves them to be of the same nature. The land comes down to the water, and the water comes up and can not rise an inch beyond the limits set by its Creator. There is not a hair's breadth of neutral space between them, we admit; and yet even this unsurpassable proximity to each other does not prove that land is water or that water is land. Should we admit that the chimpanzee approaches the lower rounds of humanity so closely that it is impossible to survey the line between the two and tell why they should not be classed in the same genus, would this prove the two natures to be identical? When we are assured by scientists that the embryo formations of the eagle and the serpent, in the ovum, are so similar in appearance that it is impossible to distinguish them with the highest magnifiers, do we rush to the conclusion that they belong to the same species of animals? The reason we do not, is that our longevity is sufficient to witness their respective developments and to correct such a blunder; and may not higher intelligences live long enough to see how grown-up men and animals will develop in their future, having natural elements so different, that one will prove to be only "of the earth, earthy," while the other has in them the

elements of perpetual existence? There are *constitutional* differences between the embryo life of the eagle and that of the serpent that we can not discover by the microscope,—differences hid away out of sight in their “mental and vital organizations,” which nevertheless are all-potent in shaping one for the dust and the other for the clouds. Does their great similarity, and even apparent identity, prove a similar nature and identical destiny? If not, what logic can prove that certain striking similarities between the highest animals and the lowest men prove them all to be animals alike? There is a point of time in every twilight when it is difficult to tell whether there is more day or night in it; but does this prove that day and night are the same? Now the above point of approximation between men and animals is, above all others, the most favorable to the materialistic position, as it represents neither the average man nor the average animal, but compares the highest of the one with the lowest of the other. In the distant and dusky horizon, a dim mountain-range often resembles a low cloud; but clouds and mountains are not therefore the same, nor does this prove the earth and sky to be all one. It is only an apparent confusion of the lowest cloud with the highest mountain slope. It would be just as fair to compare the highest man with the lowest animal, to obtain a just estimate of the comparative grades of these two great kingdoms. To pit the chimpanzee against the lowest cannibal, would be as unfair as to let Newton represent humanity and a moth the animal world.

But granting the materialist all the advantage he asks in the comparison, the strength of iron still rests in the conclusion that a striking similarity in physical organization utterly fails to prove identity of class, genus, or even of species,—in physical being, not to mention the nature of the mind.

Is it now everywhere admitted that the protoplasm of animals and of plants is in every respect identical, as far as can be discovered by the best microscopes? And does this prove that a vegetable is an animal and that an animal is a vegetable, or that there are no constitutional differences between the two protoplasm? Admit that, in respiration and in other respects, these two growths are very similar, there is no possibility of mistaking the one kingdom for the other. So if the Hawaiaian cannibal of sixty years ago and the African gorilla were as much alike as a vegetable and an animal protoplasm, would it prove that such a man and such a beast are alike mortal or immortal, as the case may be? Or can the greatest similarities between them discourage any

sound argument, deduced from science or philosophy, for the immortality of man, on the ground that it would necessarily involve the immortality of animals, and thereby prove too much?

We might go even further, and admit all they claim as to physical construction, and yet deny their conclusions; for the loadstone and a common stone might be of the same size, color, weight, and configuration, and yet be very different in their *internal* natures. The loadstone has a soul, a spirit, a magnetic power in it that can not be detected by the microscope; and so has man a spirit, an “inner man,” invisible to the outward eye, whose form can not be discerned, and whose local habitation in the body the dissecting-room is wholly unable to ascertain.

The argument so forcibly developed in “*The Problem of Human Life*,” based upon the respective capacities of men and animals, should never be forgotten by those who wish to understand this subject. That the animal seems to have received his little gift all at once, and is not expected to improve upon it, or to “gain other five talents.” The bird never improves in building its nest, nor the bee its cell; but man’s capacity for receiving and imparting instruction seems to be unlimited, if only life and health could be here forever continued. Then, again, no proof has ever been presented of a *moral* nature in even the highest animals, manifested in compunction of conscience, or regret for wrong-doing, *because it was wrong*. They may be afraid to repeat certain forbidden acts, but can not be made *sorry* for it because it was *wrong*.

It is always to be understood that we do not appeal to such arguments as these because we think the testimony of the Bible insufficient; but because some honest minds stumble along here, who neither read the Bible nor understand that Christ has “brought life and immortality to light.” Every believer, however, rejoices to find Nature and Revelation standing up together, like the two great apocalyptic “witnesses,” to solve and expound “*The Problem of Human Life, Here and Hereafter*,” to all who wish in this life to know what is knowable about the world to come.

EXPERIMENTS AND EXPERIMENTERS IN SOUND.

BY CAPT. R. KELSO CARTER, A. M.

THE name of Alfred Marshall Mayer is one familiar to American ears as that of a man perhaps more prominently before the public in acoustical investigation than any other. It is,

therefore, not without some degree of hesitation that I venture to attack his published experiments, especially when I read in the preface of his really admirable little work on "Sound," at page 7 of the preface: "*Each experiment has been made by me over and over again, and the series has been performed before me by beginners in the art. I therefore know that they will all succeed, if my directions are perseveringly followed.*" Notwithstanding the confident assertion contained in the last sentence of the above quotation, I feel impelled at this juncture to stand forth in the light of *The Problem of Human Life*, and, as an honest witness, assert with equal confidence that some of Prof. Mayer's experiments, described in the little book in question and said to have been performed by him over and over again, *will not succeed*, no matter how faithfully his directions are followed; and further, to show that the explanations given by him of some of the observed facts in acoustics, while often clear and satisfactory, are in other cases absolutely and entirely destructive of the very object of such explanations. A grave charge, truly; but the facts to be presented will speak for themselves. As is well known, there has been, so far, in the history of science, but one theory of sound, known under the name of the "wave-theory"; and, of course, this branch of science must yield to the general law, that, when a given theory is shown to be seriously inconsistent with observed and unquestionable facts, the theory must go overboard at once. In this way, as all students know, the theory of heat has been changed two or three times during the last century; and, since the appearance of that most remarkable book, *The Problem of Human Life*, there can be no doubt in the mind of any candid investigator that the wave-theory of sound must yield its ancient seat and give way before the march of truth. I have taught this theory for years in the Pennsylvania Military Academy, but I teach it no more; and though at present in the chair of higher mathematics, I find my fondness for experimental investigation wonderfully quickened by the great revolution in thought brought about by "The Problem." A single idea presented in that work should be sufficient to convince every candid mind of the insufficiency of the wave-theory. I refer to the self-evident impossibility of a tuning-fork moving at the rate of only a few inches a second, propelling waves of air at a velocity of 1120 feet a second, and the equal absurdity of a number of forks, each moving at different rates of velocity, causing the air-waves in all cases to move at the same rate! When anything more utterly

preposterous than this can be found outside of science, so fond of boasting of its exactitude, that boast will come with somewhat better grace. But of this, more anon.

In reviewing Prof. Mayer's experiments, I am not prepared to lay down any plan of procedure in advance; but will take up any one that attracts my attention as being fallacious, and show wherein its weakness lies, without any particular regard to consecutiveness of thought. In the very beginning, it may be well to consider the experiment which has been regarded as the best and most mathematical proof of the wave-theory. Nothing is so pleasing to the scientific investigator as to be able to advance a positive mathematical demonstration of his theory; and therefore I will take great pleasure in showing that the best mathematics ever put into the wave-theory is utterly false in its deductions, because founded upon false premises and bungling experimentation. I think the use of the word "bungling" will be pardoned by all who read what follows,—not that I mean to cast any reflection upon Prof. Mayer's ability, but rather upon the want of care, and especially the lack of thoroughness that are so conspicuous in his own and Prof. Tyndall's experiments, herein to be considered. The one in question consists in holding a sounding-fork over a tall glass vessel, and pouring in water until a column of air is obtained that resounds loudly in unison with the fork; or, as Prof. Mayer gives it in "Sound," page 121, by fitting a glass tube of a diameter of nearly an inch with a sliding cork, and moving this cork up and down until the point of greatest resonance is obtained. Tyndall's experiment has been sharply and honestly overhauled by Wilford Hall in "The Problem," showing that the key of his mistake probably lay in the accident of using a jar with a flaring or bell mouth; but I will show that this is not the only key. The case against Tyndall is even worse than Wilford supposed; and when we come to consider Prof. Mayer's experiment, it increases in mystery. It is always best, however, to give the full statement of the case; and I will therefore give in full the language of both the distinguished gentlemen referred to. In Tyndall's *Lecture on Sound*, page 172, he says:

"A series of tuning-forks stands before you, whose rates of vibration have been determined by the *siren*. This one, you will remember, vibrates 256 times in a second, the length of the sonorous wave which it produces being therefore 4 ft. 5 in. The fork is now detached from its case, so that when struck against its pad you hardly hear it. I hold the vibrating fork over this glass jar, 18 inches deep; but you still fail to hear the sound of the fork. Preserving the fork in its position, I pour

water with the least possible noise into the jar. The column of air underneath the fork becomes shorter as the water rises. The sound, you observe, augments in intensity; and when the water reaches a certain level, it burts forth with extraordinary power. . . . Experimenting thus, I learn that there is one particular length of the column of air which, when the fork is placed above it, produces maximum augmentation of the sound. This re-enforcement of the sound is called *resonance*.

. . . Our next question is, what is the length of the column of air which most powerfully resounds to this fork? By measurement with a two-foot rule, I find it to be thirteen inches. But the length of the wave emitted by the fork is fifty-two inches; hence, the length of the column of air which resounds to the fork is equal to one fourth the length of the wave produced by the fork. This rule is general, and might be illustrated by any other fork instead of this one."

Now hear Prof. Mayer's statement of the experiment.—

"Get a glass tube, $\frac{1}{4}$ inch in diameter and 12 inches long, and a cork one inch thick, which slides neatly in the tube. Put the cork into one end of the tube, and, holding a stick upright, press the cork down on it. The fork is now vibrated and held over the open end of the tube, while the cork is forced up the tube with the stick till the column of air in the tube is brought in to tune with the fork. This you will know by the tube sending out a loud sound. Try this several times, *till you are sure of the exact place* where the cork should be to make the tube give the loudest sound. . . . Our experiment has taught us that the tube must have a certain depth of air in it to resound loudly to the A-fork. *Let us measure this depth.* We find it to be 7.2-3 inches, *when the air has a temperature of 68° Fahr.* From this measure, and from the knowledge that a fork makes 441 vibrations in one second, we can compute the velocity of sound in air. . . . Now the tube must be as long as a quarter wave-length; so that by the time the prong of the fork has gone from *a* to *b*, and is just beginning its back-swing from *b* to *a*, the half-wave has just had time to go to the bottom of the tube, to be reflected back, and to reach the prong *b* at the very moment it begins its back-swing; . . . and thus the air at the mouth of the tube and the prong of the fork swing together, and the sound of the fork is greatly strengthened. If the depth of the quarter of the wave made by the A-fork is 7.2-3 inches, the whole wave is 30.64 inches, or 2.55 ft. But we have already learned that, when the A-fork has vibrated for one second, it has spread 441 sonorous waves all around it. As one wave extends 2.55 ft. from the fork, 441 waves will extend 1124 ft. . . . In other words, this is the velocity of sound in air at 68° Fahr., as found by the fork and resonant tube. Thus we find that the most modest apparatus, when used with patience and thoughtfulness, can solve problems which, at first sight, may appear far beyond our power."—*Sound*, pp. 120-122.

These extracts are somewhat lengthy; but are needed in full in order that we may be perfectly sure just what has been and is taught by these high authorities on *Sound*. At page

279 of "The Problem," the author states that he carefully tried a fork like Prof. Tyndall's, making 256 vibrations in a second, and found that with true cylinders, the depth of the air-column was invariably $11\frac{1}{4}$ inches. Soon after reading this, I took a fine C-fork of 256 vibrations, very accurately tuned, and tried the experiments with several glass cylinders, by pouring in the water as described by Prof. Tyndall. After repeated trials, I found that Wilford's number was evidently correct, and Tyndall's as evidently and grossly in error. I will state here that a "two-foot rule" may be accurate enough for Prof. Tyndall; but it is certainly a very clumsy means of ascertaining the truth. I am forcibly reminded of a certain crazy circle-squarer, who, in order to show that the high decimals of the accepted method were wrong, had a couple of tin cups constructed by a tinsmith,—one a cube and the other a cylinder,—in order to obtain the true relation between square and circle, by measuring the volume of water held by each! Instead of "a two-foot rule" I used a fine engine-divided paper-scale, graduated 50 parts to the inch, and repeated my measurements again and again. Having found that Wilford's number of $11\frac{1}{4}$ inches was very nearly if not exactly the correct one, I accepted his theory of Tyndall's use of a flaring vessel as the only key to the mistake of that eminent scientist. But a short time ago, in glancing over Prof. Mayer's little work, I was struck by the fact of his using a tube with a sliding cork; and, on examining his figure, I saw a straight tube represented without any flare at all. Here was a new scent. Either Prof. Mayer had recorded a flat falsehood, or else there was more in the subject than even Wilford had suspected. Of course I could not and did not suppose the former; so I at once set about discovering the solution of the mystery. Prof. Mayer uses an A-fork of 441 vibrations, as will be seen by reference to his description quoted above. Now I happened to have in hand two A-forks, with their resonant boxes, precisely like the one used by Prof. Mayer, and coming from the factory attached to his own college,—the very thing described in his book, and represented in his diagrams. I at once got them out, and proceeded to arrange a tube with a sliding cork, just as he describes, except that I attached the cork to a sort of piston-rod, so I could more readily draw it back and forth, and thus aid the fixing of the exact point of greatest resonance. I prepared this tube with the greater care, because I had found more or less difficulty in pouring water into a glass cylinder *a la* Tyndall, to tell with certainty just when the desired point was reached.

Holding the A-fork over the tube, I slid the cork back and forth a great many times, and measured the distance with my fine scale. So uniform were the results, that I found three or four consecutive trials giving the same measurement to the fiftieth part of an inch. This was conclusive,—as, of course, in a smooth glass tube I could not possibly remember where I had measured from any previous experiment.

I found that Prof. Mayer's A-fork caused a column of air to resound most loudly when *the depth was precisely 7.4 inches*. This would give for the whole wave-length 29.6 inches, 2.475 feet, against the 7.2-3 inches and 2.55 feet found by Prof. Mayer.

Multiplying the 2.475 feet by the number of vibrations (441), we have only 1089 feet for the velocity of sound. This evidently won't do, as the velocity should be 1124 for a temperature of 68° F., and my experiment was conducted in a room with a temperature of more than 70°. At this juncture it occurred to me—why not measure the resonant box that came with the A-fork? At once I applied my delicate scale, and the result was 7.5 (a trifle scant). Here, then, appears the curious fact of a professor of acoustics proving the wave-theory by the use of a number for the length of a resonant tube, while his mechanical assistant, not having any particular theory before his eyes, constructs such a resonant tube of wood and sends it out, under the Professor's own recommendation, bearing on its face a very different length. But some one will object, just here, that the difference between the three numbers given, namely, 7.2-3, 7.5, and 7.4, is inconsequential. Softly,—not, so fast. A difference of more than one-fifth of an inch may not seem to be of any great importance; but it is a very simple matter to show that such a fraction is vital to the whole theory, and is even unconsciously shown to be so by Prof. Mayer himself. On page 96 he speaks of a fork filling the air for 1100 feet around it with shells of rarefaction and condensation, and says:—

Hence the depth of two shells—one of condensed the other of rarefied air—found by this fork is 1100 divided by 440, which is $2\frac{1}{2}$ feet. The length thus obtained is called a wave-length."

An inquisitive mind might very naturally inquire, Why did he use 1100 and 440, when on page 122 he uses 1124 and 441 for the same fork? And I confess that I scarcely know what answer to make. In truth, I would be delighted if Prof. Mayer would only rise and explain. It is very evident, however, that in using 1100 for the velocity of sound, 441 would not give the full value of $2\frac{1}{2}$ feet for the wave-

length; and it may be that the Professor was dimly reminded of some tube and cork experiments made by himself, and by beginners in the art in his presence, which had seemed to require a wave-length of 2.55 feet, and therefore the single vibration was unconsciously dropped from the fork in order that the standard of $2\frac{1}{2}$ might not be sensibly lost. But when the investigation turns on the length of the resonant tube, the fraction becomes more important, and in the opposite direction; consequently, we find the wave-length calculated to hundredths of an inch (though even then not so accurately as it should have been), and the one vibration restored to the fork. Why? *Manifestly to make things fit*. There can be no other answer given than this. I mean no possible suggestion of dishonesty in the matter; but I do mean that an honest investigator, blinded by a pet theory, unconsciously felt that all things *must be made* to chime with that theory; and if they did not do so at first, a few numbers here and there must be changed until it did,—under a half-formed impression that inaccuracies of experiment, &c., would sufficiently account for these alterations. Undoubtedly there was no intention in the matter; but without question such license in mathematics was extremely careless and very reprehensible. There can be no contradictions in truth. If any appear, it becomes the duty of every honest investigator to seek the cause of the trouble, and not attempt to blot out the trouble itself upon paper with a few strokes of the pencil. Now the real truth is, that there is in this experiment of the resonant tube a very serious conflict between theories and facts. The length of a tube, resounding with a fork, *is not* such as to produce the velocity of sound by any sort of calculation that is squarely conducted. That it comes somewhere near to it is not questioned; but even that will depend upon what is allowed to be "near to it." A difference of considerably over one hundred feet, which exists with certain notes, as I will show hereafter, can hardly be called "near" to a definite number.

The velocity of sound, at ordinary temperatures, is about 1120 feet per second, and *is not* 1100, much less 1089 or 880. Yet I stand prepared to show that with certain notes the resonant-tube calculation would reduce the velocity of sound to the last-named number. Yet Prof. Tyndall exclaims, "*This rule is general*." The simple truth being, however, that Prof. Tyndall had never tried the experiment, as he should have done before making any such sweeping assertion as that.

Now it is an obvious fact that the practical manufacturers of acoustical instruments labor

assiduously to make their machines produce the best results ; and when we find the resonant box constructed for Prof. Mayer's A-fork measuring 7.5 inches in depth as opposed to his 7 2-3 inches, the weight of inference seems a little against the Professor. But when, in addition, we take C-forks of 256 vibrations, made by the famous Koenig, of Paris, and find their resonant boxes measuring 11 $\frac{1}{4}$ inches in depth instead of 13 as called for by Prof. Tyndall's experiment, the case begins to grow very dark for the scientists. But this is but the beginning of the shadow. From the measurements made in resonant columns of air in a glass cylinder containing water, and in a tube with sliding cork, I became convinced, that, for some curious reason, neither was very accurate ; and therefore tried extensive experiments with a new and ingenious apparatus devised by Capt. B. F. Morley, my successor in the chair of Natural Science. In another issue I will present the reasons for discarding both the tubes described by Tyndall and Mayer, and give some of the astonishing results obtained from continued experiments.

PENNSYLVANIA MILITARY ACADEMY, Jan. 24, 1882.

TRUE, YET INCOMPREHENSIBLE.

BY REV. T. WILLISTON.

In the January number of *The Microcosm* I endeavored to show that Reason's cosmogony is the very same with that of Moses, and that He who "in the beginning created the heaven and the earth," was Himself without beginning : in other words, was eternal. No Bible was needed to convince us that there is a God, or that He alone has existed from eternity ; for that conclusion is forced upon us by Reason herself. That there is one uncaused, self-existent Intelligence, or Mind, is as susceptible of demonstration as any theorem of Euclid ; but *how* even God could exist without ever *beginning* to exist, is one of the most incomprehensible truths ever presented for man to contemplate. We *know* it to be true that God has had no beginning ; we are absolutely certain that He has always existed ; but *how this is possible* is a question we are unable to solve. It is questionable whether even Gabriel himself can solve it. A mother, we will suppose, is talking to her little boy about God, and telling him how the world and all it contains were made by Him. The little fellow breaks in, "You say God made us and everything else, who made God, mamma?" "Why, what a question, Dickie ! Don't you know God didn't have to be made?" "Why not, ma ? You and

I had to be made, and so did everything else, Why didn't God have to?" What can that mother say now ? How get rid of that inquisitive and persistent little teaser ? Why, if she is honest, she will have to say, "You have asked me a question, Dickie, that I can't answer." No, madam, you can not ; nor can the profoundest thinker or most eminent philosopher that the world has ever known. All he could answer would be, "I know that *something must have always* existed, and that that something, whatever name you give it, *must be* absolutely independent and almighty ; but *how any* thing, be it mind or matter, corporeal or intellectual, could exist *uncaused, or without any beginning*, is a problem too profound for my limited powers to grapple with.

Reader, I know of one other truth that is seemingly as unfathomable as *existence without beginning*, and it is this : How man can be entirely free, and wholly responsible for all his doings, when the Bible makes it certain "that all those doings of his were foreordained, or embraced in the eternal purpose of God ! That the two propositions are both of them immutably true, we may be absolutely certain ; but how they are reconcilable is a question that has perplexed and puzzled some of the profoundest theologians and thinkers. I would like to argue that question right here ; but a literary and scientific journal is not the proper place for such a discussion, and its editor would hardly thank me for turning his paper into an arena for a theological tournament.

With one important inference from the foregoing truths I will close. It is this : *a proposition may be indisputably true, and yet be hard to understand and even be incomprehensible.* That is an inference which it would be well for all rationalists and pseudo scientists to steadily keep the mind's eye upon. It is an inference that rebukes those neologists who are trying hard to explain away the miracles of the Bible ; and also those materialists who can accept nothing as true unless it will admit of what they please to style demonstration. "Did you ever *see* a soul?" said a materialist who regarded *thinking* as a mere property of a man's brain, or of cerebral organization, and as inseparable from the organism that produced it. He was silenced by the reply, "Did you ever *see* a pain? I never *saw* a pain ; but I have many times *felt* one. And so, thank God, I *feel* the workings of a spirit within me that is totally distinct from the tenement it occupies. That spirit is not discernible by the eye, nor did I ever *see* a soul ; but I am absolutely sure that I have one,—yes, and one that is never to die." Oh, the infatuation of those who wi^l

believe nothing that is not discernible by the senses, or that their limited intellects are unable to grasp and comprehend!

THAT \$5,000 CASH PRIZE.

BALTIMORE, Md., Feb. 10, 1882.

Editor of The Microcosm.

DEAR SIR: I am disgusted, beyond words to express. Let me tell you why. I saw for the first time, about a week ago, the offer of the \$5,000 cash prize made by Joseph Goodrich, as published in the January *Microcosm*. A friend placed it in my hands, knowing that I had spent much time in sound-investigations, and had made many experiments in that department of physics. He suggested that I now had a chance to turn my acoustical knowledge to some account. I read the offer with dilated eyes; and to make sure there was no mistake about it, I re-read it carefully. "This means business," said I to my friend, "and I already feel richer by about \$5,000 than I did before I saw that notice!" In a word, I resolved to appropriate that prize as so much abandoned property, since I felt as certain of the truth of the wave-theory of sound, and my ability to produce silence by sounding two unison instruments half a wave-length apart, as I felt sure I could hear either instrument when sounded separately.

I took Tyndall's *Lectures on Sound* from the bookcase, and turning to page 259, I there read for the doventh time the positive proof that two forks in unison, thus sounded together, would neutralize each other's tone and cause silence, because a *condensation* of the air from one fork, as he scientifically proves, would reach the other fork just in time to coalesce with its *rarefaction*; and as two systems of waves would thus be in absolute interference, quiescence of the air in the line of the two forks would necessarily follow. I thus felt that I had a sure thing; and called my wife to tell her of my good fortune.

To fortify my hopes, which, however, hardly needed strengthening, and to make assurance doubly sure, I went to one of the professors of the Johns Hopkins University, who makes sound-phenomena a special study, and without letting him into the secret of the lead I had struck, asked him in a quiet way if interference and silence would really result from sounding two unison instruments half a wave-length apart, as taught by science. He answered, "undoubtedly"; and referred me to Tyndall and several other text-books as proof. This was sufficient, and I went home joyfully to prepare my experiment; and on my way home spoke to a notary to be prepared in the morn-

ing to take my deposition, in accordance with the conditions required by Mr. Goodrich in his offer, and upon which he would pay over the \$5,000. Suffice it to say, my experiment was not long in preparation. I mounted two unison forks upon their resonant cases, and placed them, as Prof. Tyndall directed, half a wave-length apart. But on testing them, to my surprise, no difference whatever was discernible in the sound between this distance and a full wave-length. I tried them over and over a hundred times, and listened in all directions, with the forks at various distances from each other; but not a shadow of difference in intensity could be perceived. I then took two unison A-pitchpipes of precisely the same key, and while my wife and little girl blew them alternately at a half and a whole wave-length apart, I listened in all directions as before, but no difference whatever in intensity could be noticed. I kept them blowing till midnight, until they both became dizzy from exhaustion, so loth was I to give up the hope of possessing the \$5,000 cash prize. At last we obtained silence, but not until my wife peremptorily put a veto on the nonsense, as she called it, of trying to produce silence by making a noise! She tantalizingly suggested that I could earn the \$5,000 sooner by cutting wood at ten cents a cord, whatever science might teach. I believed her, and in sheer vindictiveness took Tyndall's book from the table, and offered up a sacrifice to the scientific gods by throwing the "Lectures on Sound" into the grate, and poking the fraudulent concern among the coals until it was consumed to ashes. The next morning, to add to my chagrin, I met the notary, and he innocently asked me if I had my affidavit prepared!

Yours in disgust,

S. C. DENNIS, A.M.

AN ACOUSTICAL PHENOMENON.

608 Washington Street, Boston, Mass.

A. WILFORD HALL.

Dear Sir: Having read your articles on sound with a great deal of interest, I would like to suggest a query. The lowest pedal-pipes of a church organ vary a great deal in effect in different parts of the building. So marked is this variation, that sometimes they seem to *cease sounding*. I have had a pedal note held and walked down the center aisle, and at certain points the pipe would be inaudible, and a change of not more than one step would bring the sound with great power. Only last Sunday, while playing an organ in this vicinity, where the keyboard is 26 feet from the case, the D-pipe in the pedal bourdon did not sound, *as I thought*. After church I remarked on the fact to the organist, who had been sitting only *three* feet from me, when, to my surprise, she pronounced it "*the best note*"

in the pedal." I took the seat she had been occupying, and found the note a splendid one. There was nothing between our seats and the front of the case, and the mouth of the pipe was in plain sight of us both.

This fact you can verify by going into any church; for, in my experience of many years as an organist and tuner, I have never seen an organ that did not illustrate this point in a greater or less degree. And this only in flue-pipes, or those constructed on the principle of the whistle. Reed-pipes, or those having their tones produced by a vibrator at the foot of the pipe, do not have this peculiarity, as far as my observation goes. Very truly yours,

JAS. R. PHELPS.

ANSWER.

The effect here described is undoubtedly due to sonorous reflection. The sound of the large pipe referred to (depending upon the air-current more than when the tone is produced by a reed) shoots up against the ceiling of the church, and is reflected against the walls and other objects, and thence in concentrated masses to certain points in the auditorium, which apparently leaves other points vacant of sound. This is illustrated by the well-known phenomena of "whispering galleries" where a mere whisper will be distinctly heard at one particular spot, fifty or more feet away, while loud conversation will be inaudible if the listener changes position but three or four feet.

Now, while the reflection of sound is a well-known fact, it is totally impossible to explain it by air-waves, which, as Prof. Helmholtz declares, travel "exactly in the same manner" as do water-waves. No one ever saw a water-wave reflect, or do anything approaching that effect. If it strikes against a perpendicular wall at an angle, it will run along the wall, continually falling back in a formless mass of water and mingling with the next succeeding wave. It does not shoot off at an angle corresponding to that of its incidence. Neither can air-waves reflect, for the same reason. Nothing, in fact, can do this but real, entitative things, constituted of corpuscles which travel with a continuous forward motion. As the air-particles in air-waves, like the water-particles in water-waves, have no continuous forward movement, but merely oscillate to and fro, remaining substantially in the same position, they can of course have no reflection. Not so, however, if sound consists of corpuscular emissions from the sounding body. Reflection at the angle of incidence is not only to be expected on such a supposition, but easily explained. This is observed in all echoes. Thus, the acoustical effect here referred to, and noticed by hundreds besides our correspondent, overthrows the wave-theory of sound, by excluding every possible solution save that of

the forward motion of substantial corpuscles of some kind. And as these corpuscles can not be material, they must be incorporeal substance.

Of course, this effect of apparent silence, described by Prof. Phelps, can not be attributed to the so-called law of *interference*, since that is caused entirely, as claimed, by the neutralizing effects of two systems of air-waves so traveling together that the condensations of one system will coalesce with the rarefactions of the other, and thus produce *quiescence* of the air,—which, of course, is all that constitutes silence, according to the current theory. As the silence at certain points in the Boston church, as reported, is caused by a single pipe, and consequently by a single system of air-waves, interference is out of the question.

THE MISSING LINK.

NORTHFIELD, Vt., January, 1882.

A. WILFORD HALL.

Dear Sir: I am obliged to you for your very prompt reply to my question the other day. I will profit by it. Here is an extract from the St. Albans (Vt.) *Messenger*, which I wish you would examine into, and let us know what it amounts to through the next *Microcosm*. By so doing you will confer a great favor.

"THE MISSING LINK FOUND.—Prof. E. D. Cope, of Philadelphia, has secured the skull of a monkey, which seems to fulfil in a remarkable degree the conditions of the missing link between man and the lower animals. It is not larger than the skull of a small ground-squirrel, and belongs to a species of marmoset. It was found in the valley of the Big Horn River, Wyoming Territory. The Professor says, 'This skull is remarkably similar—in miniature, of course,—to the human skull. The brain-space is remarkably large; and is, in fact, several times larger than the brain-space of any of the skeletons of animals of the same period of time. The characteristics of formation of the human skull are clearly defined,—so clearly as to be remarkable. The teeth are almost the same as human teeth, while the lower jaw has many strong points of similarity. I consider this skull as the earliest indication of the existence of man. It is a new species of a familiar class, and has hitherto been unknown to scientists. The connection between man and this animal, it seems to me, must have been very close,—although, of course, nine men out of every ten would raise a dispute. No animal at that time, except this peculiar species, had a head like that of a human being; and the brain space contrasted with the brain-space of other animals, or even of the monkeys of to-day, shows a very great superiority of intelligence.'"

Yours, very truly, J. B. JOHNSON.

REMARKS.

We suspect that Prof. Cope has accidentally run across a tiny monstrosity,—a deformed skull of a Rocky Mountain cony, supposed to

be a cross between the rat and the rabbit. If he has found only the skull, and that the size of a small hickory-nut, and the shape of the human cranium, with teeth "almost the same," and a lower jaw "with many strong points of similarity," showing the "earliest indication of the existence of man," we would like the Professor to inform us by what system of comparative anatomy he places so "remarkable" a specimen in the class of small monkeys. If the primeval man had a head only three quarters of an inch in diameter, with fully developed teeth, while the boasted man-apes—the gorilla, orang-outang, and chimpanzee—have large heads, teeth, lower jaws, &c., so unlike human beings, let Prof. Cope or Huxley rise and explain what natural selection was about all those ages in developing this tiny marmoset into a gorilla; or, if not on that line, let them wait before announcing the "missing link" for the unearthing of some skull resembling man's, larger than that "of a small ground-squirrel." Our evolution friends are altogether too precipitate in their announcements. Mr. Darwin distinctly declares that the "connecting link," if ever found, will be discovered among the fossils of the old-world monkeys. But here comes Prof. Cope with the skull of a new-world marmoset or mountain-rat or cony, as the veritable head of the primeval man! This is what might be called evolution in a "Big Horn."

"KIND WORDS NEVER DIE."

THE following are a few paragraphs taken from hundreds of similar letters received since the previous issue of *The Microcosm* :—

Rev. F. Hamlin, Poughkeepsie, N. Y., writes :—

"A. Wilford Hall :—I wish to thank you for giving to the world your marvelous work, *The Problem of Human Life*. To my mind it gives evolution and spontaneous generation their death-blow, while its beautiful elaboration of substantial emanations carries one close to the borderland, where the material may find its origin in the infinite substantial. Please send me your photograph, and accept mine herein. I agree with a noted Episcopal divine, with whom I conversed a few months since, that you are God's chosen instrument for the destruction of sophistical scientific theories."

Yours, with love,

F. HAMLIN.

Pastor Hedding M. E. Church.

Rev. Mr. Beekman, Worcester, Mass., writes :—

"Put *The Microcosm* in any form and at any price you please, and count on me as a sub-

scriber. I am reading *The Problem of Human Life* with the most intense satisfaction. May the life of Wilford be long spared."

Sincerely yours,

G. BEEKMAN,

Pastor M. E. Church.

Hon. Ira J. McGinnis (Judge of the Eighth Judicial Circuit), Guyandott, W. Va., writes :—

"I have just finished reading *The Problem of Human Life*, and don't hesitate to pronounce it the ablest review of modern materialism that has fallen under my observation, and I have long been reading *pro* and *con* upon the subject. I regard it as a complete overthrow of materialistic infidelity, and the utter discomfiture of its expounders—Darwin, Tyndall, Huxley, and Haeckel. I desire to subscribe for *The Literary Microcosm*, and herewith inclose the fifty cents."

Dr. J. H. Robinson, Fillmore, Ind., writes :—

"I have read your book, *The Problem of Human Life*, and have found it new and extremely interesting. It is destined to revolutionize, in some important respects, the science of physiology, as well as overturn the accepted theory of sound. The atheistic fort of *spontaneous generation* has been successfully stormed; and science, it seems to me, has been made to shed a new light on the land of the *Over There*. The great scientists reviewed will have to admit that the reviewer 'did not begin to build without first counting the cost.'"

Rev. Dr. Shatz, Millville, Ohio, writes :—

"I am in full accord with the aim and contents of *The Microcosm*. Indeed, I wish you could soon see your way clear to publish it at least every two weeks, if not every week, as the time seems so long to wait a whole month from one number to the next. I can hardly think it possible for any one who has read the paper once to be willing to do without it, even if it should cost four or six times the present amount. I consider it a gem in the scientific literature of the present age; and I believe it is destined, in the providence of God, to become a mighty engine of power to destroy the strongholds of Satan in the high places of science, falsely so-called. I believe it about time for some man to come down from the mount of God, like Moses of old, and take the golden calf of self-constituted science,—the god of infidelity,—grind it into powder, and strew its ashes into the four corners of the earth. *Apis* has been sitting long enough on the throne of Christ. It is time some champion of truth, in science and religion, bade him depart, in unmistakable words. And I believe the Lord of Hosts has chosen you to do this work, and that the prayers of all who love Zion will be with

you in your arduous task. I bid you a hearty God speed, and may much grace be yours."

J. L. SCHATZ,

Minister of the German Reformed Church.

J. C. Withers, Esq., Fairville, Mo., writes:—

"I have read carefully the works of Spencer, Darwin, Huxley, and Tyndall, with many replies from various sources; but the right man has come at last. I have just finished reading his *Problem of Human Life*, and can truthfully say I have never seen anything to equal it,—standing out, as it does, in my estimation, the world's wonder! You will sell many copies through my influence, ere the present year shall close."

W. J. N. Moyers, Atty., Benton, Ill., writes:—

"I have just finished reading, for the second time *The Problem of Human Life*, with amazement at every page. Its only proper designation is the *Incomparable*; and it will hand its author down to history as the Napoleon of scientific thought."

Sidney B. Cushman, M. D., of Wiscasset, Me., writes:—

"Your book, *The Problem of Human Life*, fills my mind with strange emotions of wonder and delight. I find it even difficult to command words of sufficient force in which to express to you my gratitude for this work, so new, so full of unanswerable truths, and so deadly fatal to the sophistries of the so-called scientists of the day. I have never read a book that has impressed itself so profoundly on my mind. Its irresistible facts and arguments are more than a match for the combined intellect of the atheistic world. It is the day-star that has suddenly burst upon the horizon; and may it send its beams into the darkest abodes of materialism. No man, it strikes me, can withstand the facts and arguments it contains, or successfully meet its logical conclusions."

Rev. Mr. Pryse, Blue Springs, Neb., writes:—

"Dear Brother Hall: May God keep you long alive, to carry forward the grand work in which you are engaged. I know that He will bless and reward you for the fearless defense you are making of the truth. It is useless for me to attempt to add to the eulogies you are receiving. They can only be just, even when the power of human language is exhausted. But in the midst of these deserved eulogies, God keep you humble and strong in the power of His might; for the forces of the adversary will be strained for your discomfiture. But your triumph is certain. I have devoured *The Microcosm*, so far, and have grown spiritually fat upon it. I am now feasting upon *The Problem of Human Life*, and oh, such a feast! I can only exclaim, as I read,—Thank God, for

Wilford Hall! Yes; enlarge *The Microcosm* at the beginning of the next volume, and raise the price to \$1. I will gladly pay it. The paper will not—*must not*—fail. We can not dispense with its tremendous blows at false science, which have already turned materialism inside out, and exposed its deformity. Before your paper shall flag, I will gratuitously make a tour of the United States, and canvass in its interest. I am getting up a club for it here. Ever your sincere friend,

J. M. PRYSES,

Pastor of the Presbyterian Church.

Prof. D. J. H. Ward, President of Northern Ohio, Collegiate Institute, South New Lyme, O., writes:—

"A. Wilford Hall: . . . The more I read *The Microcosm* the better I like it. No one book of a philosophical or scientific character has ever been of anywhere near the service to me that *The Problem of Human Life* has. May your labors be blessed and prospered. I inclose my photograph, and would esteem yours in return as a great favor."

THE OLD AND THE NEW.

A. WILFORD HALL,

Dear Sir: I have read your book, *The Problem of Human Life*, and also *The Literary Microcosm* from the commencement, with great satisfaction and profit. I have been a teacher of natural philosophy for seven years; and I am now astonished that I have been so stupid all this while as to inculcate in lectures to my classes the wave-theory of sound, that you have so effectually exploded. Since completing the reading of your work I have taught the *corpuscular theory*. Pupils have no difficulty in comprehending it; and they laugh at the ridiculous statements of their text-books, from which they have been previously taught. I am so intently interested in your work that I never fail to commend it to students, professors, and ministers. I wish every student and teacher in the colleges of this country had a copy of the book. I inclose my photograph as a memento of my high esteem, and will be pleased to have yours in return. With best wishes, yours, &c.,

E. A. ORR.

Plattsburg, Mo.

Professor C. W. Corbin, Reedsville, Pa., confirms the above view. He says—

"I am a teacher, and the principal of three schools in this place. It is needless to inform you that I teach my philosophy classes no such absurdity as the wave-theory of sound, since reading your *Problem of Human Life*."

Rev. E. P. Parker, Brick Church, N. C. writes:

"I am a subscriber to your *Literary Micro-*

cosm. and have been re-reading the back numbers. I am now anxious—almost impatiently—awaiting the appearance of the next issue. It is one of the very few papers that I have ever read over more than once. I have read *The Microcosm* from the beginning *three times*, and expect to read it through again. It seems new to me every time I read it. As a Christian and a minister (Lutheran), I rejoice in the Herculean blows you are dealing out to materialism and to infidel scientists. I enclose a list of five subscribers, and wish it were five hundred."

Rev. F. G. McHenry, Bull's City, Kansas, writes :

"Inclosed find three subscribers for the following club :— . . . I do not canvass for *The Microcosm* and *Problem of Human Life* for the money there is in them ; but I regard them as absolute necessities in every house, and I will endeavor to secure them a place in each house in my mission-field." Yours, &c.,

F. G. MCHENRY,
Pastor First Cong. Church.

SPIRITUALISM.—DR. COVERT'S LETTER.

A. WILFORD HALL.

Dear Sir: I have just completed a careful reading of your book, *The Problem of Human Life*. You must not regard it as flattery when I say to you that it is a grand production. While I have been accustomed to regard man as a triune being, consisting of body, soul, and spirit, yet by regarding the soul and spirit as inseparably united, it seems to render your view of man's duality as correct.

But I write to get your real views of modern spiritualism, to which you make only a casual though not unfavorable allusion at page 40 of *The Problem of Human Life*. Can it be possible that the thousands of cases of materialization, written messages, table tipplings, &c., reported as occurring all over the country, are nothing but trickery and collusion, and so adroitly conducted as to deceive the most careful investigators? If these physical phenomena really do take place, then how are we to account for their occurrence, unless they come from disembodied spirits? Please answer in *The Microcosm*. Yours, very truly,
Oregon, Ind

JOHN COVERT.

ANSWER.

We are not a believer in spiritualism, in the modern or mediumistic sense of that term. But as a scientific investigator we have no hesitation in saying that we are not only ready to accept it when proved, but desire, above all earthly possessions, the evidence which will satisfactorily establish the truth of these supposed supercoporeal manifestations. As we state in *The Problem of Human Life*, we care not whether these communications are from

good, bad, or indifferent spirits, so they are only intelligences that have departed this life and consequently are now separate from physical organisms. Such demonstrations would be a scientific annihilation of materialism, and would absolutely show that the mental, vital, and spiritual part of man, is an entity that can live in a conscious state of being separate from the body. Superadd such scientific proofs to the spiritual evidence of Divine revelation and the intuitions implanted in every man's breast by the Creator himself, and such a consummation would make this a new world to man.

If the spiritualists of the United States, numbering among them thousands of profound thinkers and logical reasoners, do really believe and, as they claim, *know* that these physical demonstrations are genuine, they have now an excellent opportunity of making a convert of a journal that will fearlessly give the facts to 50,000 readers, who, if they will not at once accept them, will at least respectfully and candidly investigate and consider them. We feel safe in saying, that of the five thousand ministers of various denominations who are now taking this paper, and who are justly prejudiced against mediumistic spiritualism by reason of the trickery so frequently exposed under its guise, not one would object to its demonstration by genuine facts, nor refuse to continue *The Microcosm* because such facts were truthfully reported in its columns. Let spiritualists, therefore, instead of sending their startling, and, we fear many times, exaggerated reports of *seances* to the *Banner of Light* and other journals which few except spiritualists read, take a new departure, and bring their forces to bear on the editor of a paper, who, when once soundly converted (as he is entirely willing and anxious to be), can do their cause some good. We will wait patiently for the first *seance* at the office of *The Microcosm*. So bring on your batteries.

MAGNETISM VS. MATERIALISM.

AMONG the various considerations drawn from Nature and science in favor of the substantial nature of the soul and a probable future life for man, not one seems to us to possess the force of that based upon the action of magnetism. This argument has been elaborately discussed in the second chapter of *The Problem of Human Life*, and in the two articles in this paper on the *Immortality of the Soul*—*can it be proved by science?* We believe that no candid man who reads and fully grasps those arguments will entertain a rational doubt in regard to the substantial existence of God, or the entitative nature of his own soul. As proof of

the efficacy of this wonderful natural force, we had the pleasure recently of converting one of the most confirmed atheists we ever knew to a belief in the existence of God, the substantial nature of the soul, and the strong probability of a conscious hereafter for humanity,—all by means of the scientific results, obtained from a common horseshoe steel magnet which we constantly carry in our pocket as a leaf plucked from God's primeval thesaurus.

Our experiment first consisted in placing a dozen or more common needles in a glass plate, and then passing the poles of the magnet beneath the plate, thus causing the needles to follow the motions of the magnet which so evidently sent its substantial rays of force through this impervious body. This was done as if nothing whatever intervened. We need not give the details of the reasoning in favor of the substantial nature of all force, including life-force, which accompanied this experiment. Those who have read our published treatise upon this startling analogy drawn from the laboratory of Nature, are familiar with that unanswerable argument. Our friend, however, who had so long and so strenuously insisted that the soul or life-force was only the motion of the physical particles of the brain, and that all the other forces of Nature were but modes of molecular vibration, felt himself driven to admit that magnetism must be at least a substance, since it moved a ponderable and inert body; but he insisted that it was utterly impossible for one substance to pass through another, as if nothing were in the way, and thus act upon and manipulate another body, unless there were openings through which it could pass. Here his mind became confused, and his ideas seemed utterly demoralized,—as he had, up to this time, no conception of such a distinction in Nature as an *immaterial substance*, regarding, like all materialists, *substance* and *matter* as synonymous, and consequently as convertible terms. A short lecture, however, soon set him right upon this. But, not to be converted so easily, he suggested the idea that this magnetic substance might still be a subtile form of *matter*, and that it must pass through the plate by entering pores in the glass too minute to be observed by our senses. At his suggestion the plate was then partly filled with water, which he acknowledged to be practically free from pores. The needles were then placed upon a paper card, and thus floated upon the surface of the water, when, to his surprise, the magnet, moving as before beneath the plate, caused the card with its cargo of steel to follow its every motion.

This settled the question beyond a doubt, because he freely acknowledged, if there were

any pores at all through the glass and water, that they must be so trifling as to afford but little if any chance for the passage of this substance, if material; whereas it evidently went through both glass and water the same precisely as if nothing at all had intervened, *since no stronger effect was produced upon the card and needles by holding the magnet the same distance above them without any object whatever interposed!* Hence the existence of a real substance, not material nor subject to material conditions, was here finally and fully demonstrated, and my friend frankly admitted that if such a substance really existed, he could no longer see any valid reason for denying the incorporeal but substantial existence of the soul or life-force,—since it, like the magnetic force, moves corporeal bodies. He further admitted that if the soul and the conscious, spiritual part of man were substantial, though invisible and intangible, he could no longer see a reasonable excuse for denying a substantial, intelligent, and personal Deity,—the maker and organizer of the universe; and he thanked us with tears in his eyes for the demonstration we had given him.

Yet, important as is this argument against materialism, and as accessible as it has been for more than a hundred years to Christian scientists, we believe it is now conceded that *The Problem of Human Life* contains the first intimation ever published of this overwhelming consideration in proof of an entitative soul and the probable existence of man after death. We call attention to this argument here, with the firm conviction that no weapon so powerful against materialism and all kinds of scientific skepticism exists on this earth, as the common steel magnet to which we have here referred; and we believe that no minister or layman should be without such a resistless catapult in the impending conflict with materialistic unbelief. Not only is its importance almost immeasurable in answering the objections of materialists; but next to viewing the starry heavens, will its marvelous effects prove a solace in strengthening the faith of the Christian in the invisible entities of the universe, and in keeping fresh before his eyes the probable presence of the invisible but no less substantial God.

Lose no time, then, dear reader, in arming yourself with this evidence from the book of Nature. A good steel magnet can be purchased for 50 cents in any city, and should be carried in every Christian man's pocket as a companion-piece to the Holy Bible. Should any reader be unable to purchase this weapon near his home, we will send one by mail to any address, if the postage (5 cents) be added to the above price.

DR. TALMAGE ON STOCK-GAMBLING.

THE eminent pastor of the Brooklyn Tabernacle some time ago preached a scathing sermon against stock-gambling in Wall Street, a report of which has come under our notice. He characterizes this business as among the wicked crimes of this wicked city. But before he closed his sermon, he threw a tub to the prodigious whale of the Stock Exchange, by saying that the man who sells stocks as a "legitimate business," charging only a "regular commission" for his services, may be a pure Christian man! That is to say, the opulent member who owns a seat in the Stock Exchange worth \$20,000 (and this speculative privilege can not be owned for less), and who sells "puts," "calls," and "straddles," to boys and men from Monday morning till Saturday night, may be a good Christian, while the poor countryman who chances to stroll down Broad Street, and is there lured by this "legitimate business" to risk his wife's last dollar on one hundred shares of "Lake Shore," or "Western Union," and thus lose it, becomes a stock-gambler,—on a par, in the estimation of Dr. Talmage, with the meanest street loafer "who pitches pennies for drinks"! Yes; the man who follows this "legitimate business" of tempting clerks and cashiers to purloin trust-funds with which to try their luck by going "short" on Erie, is, or at least may be, a good Christian, if he happens to be a pewholder, as we may suppose, in a fashionable church; but the bank teller who is thus tempted to aid this "Christian man" in swelling his profits in such a "legitimate business" is a "stock-gambler" and a suitable candidate for the state-prison. This representative of the Saviour would whip with his scourge of small cords unmercifully the men who *bought* doves, while letting the men who *sold* them go scot free! Why this distinction in favor of the "bloated bondholders" who are able to occupy seats worth \$20,000 each in the Stock Exchange? By the same logic the wealthy owner of a faro-bank, who deals out the cards as a "legitimate business" and who takes only his "regular commission," may be a pure Christian man, while the ignorant street gamin, who is thus tempted to bet on the cards as they are dealt out is a reprehensible gambler! We are tempted to ask Dr. Talmage if the fact that these "legitimate" stockbrokers are supporters of the Tabernacle Church had nothing whatever to do with this sage distinction between playing the game and betting on it? The man who could preach such a sermon would have but a single step to take, and ought not to strain his conscience very much in taking it, to lash the tip-

plers as criminals of the blackest die, while claiming that the owner of a bar where liquor is sold might be a genuine Christian, since his business is legally "legitimate," and since he only receives his "regular commissions" from his customers as profits on his sales! Is there not some minister in this city or elsewhere who dares to rebuke sin in high places, and thus shame the devil, let who will take offense?

YELLOW FEVER.

DR. B. H. TRIPP, of Gallatin, Tenn., writes us a paper, too long to print, but embracing important suggestions upon the cause and means of preventing yellow fever. The substance of his suggestions is that the germs of yellow fever are of a poisonous malarial nature, exhaled from the earth in certain localities and under certain conditions, and that these germs are confined by their gravity near to the earth's surface, scarcely ever rising much above it. Hence the observed fact that those living upon hills, even in fever-infected districts, escape the contagion. He suggests, as the only sure protection to those living on low grounds in such districts, some means of supplying their houses, and especially their sleeping apartments, with air from higher altitudes than the house itself. He thinks every such house should be provided with a kind of tower extending as high as convenient above the roof, and with suitable tubes extending down into the various parts of the building, as we would supply our houses with pure and cool water from an elevated spring. He thinks that such elevated air-tubes could be readily connected with inexpensive sails and vanes which would shift with the wind, and thus constantly guide into the tubes, and supply a residence with a pure atmosphere that would practically prevent this dangerous disease from getting a foothold. We earnestly think this reasoning sound, and worthy of consideration.

JOSEPH GOODRICH'S LETTER!

NEW YORK, Feb. 15, 1892.

HALL & Co.

Gents: Many of my friends have asked my opinion of your book, *The Problem of Human Life*, as a literary production. I desire to answer them through the columns of *The Microcosm* by quoting below a single short paragraph from the book itself, page 471, which will embody my appreciation of its merits more fully than any words of mine can express it. Without intending flattery to any one, if there occurs another passage in the English language of purer diction, grander eloquence, or sub-

limer sentiment, I confess to not having discovered it in more than thirty years of careful reading. Yours truly, JOSEPH GOODRICH.

"Even the infant, at birth, or before it has a conscious thought, is thus the heir by title-deed to immortal life, though its actual knowledge is not the millionth part that of the pig or puppy of the same age. It starts thus a blank as to intelligence, but having the infinite indorsement of its father and mother, which involves the undeveloped capability of analyzing the stars and weighing the planets, it holds wrapped up in its vital and mental organism the ego of an indestructible personal identity; and should it thus die untaught, and even unconscious of its own being, its *magna charta* of self-hood will be its passport to the primary college of the angels, thence to the university over whose entrance is written in letters of life—The Garden of Eternal Progress."

CONTRIBUTORS CRITICISING EACH OTHER.

We have received three or four quite able articles containing criticisms of other articles previously published from our contributors. These, we regret to say, we deem it inexpedient to print. We should not object to seeing the questions discussed by our contributors ventilated by critical discussion in our columns, had we room for such extended controversy. But in every such instance the original writer would inevitably and justly claim the right to reply; and there would be little likelihood that either party would be satisfied until we had got ourselves into hot water with our readers, by admitting to our columns a virulent and somewhat profitless controversy. To admit one such attack upon the paper of a contributor, would be to open the door to a dozen, till our paper would in a short time bristle with polemical bayonets over a few questions, of which our readers might become tired. We have therefore been compelled to adopt the policy of allowing each contributor to present his own views of whatever original theme he may wish to discuss, within reasonable bounds; and in this manner treat all alike, and at the same time give our readers the greatest possible variety of original essays. We trust this course will commend itself to the judgment of the friends to whom we have referred.

TO NEW SUBSCRIBERS.

As the next volume of *The Microcosm* is to be enlarged, improved in form (magazine with cover), and the price raised from 50 cents as at present to \$1 a year, it will be impossible to allow new subscribers to begin their subscriptions with some number in this volume and thus extend it over into the midst of the next. All new subscribers during this volume will

therefore be expected to take it from the commencement, as nineteen out of every twenty request. There are many different articles in the back numbers, each of which is regarded alone worth more than 50 cents. We have a full supply of all the back numbers, and many of our most intelligent subscribers are sending for duplicate sets from the commencement, in view of having them unsoiled and permanently filing them for future reference. We also notice with pleasure that subscribers are already beginning to send in their dollars in advance for the second volume, so anxious do they seem that by no possible casualty shall they miss it.

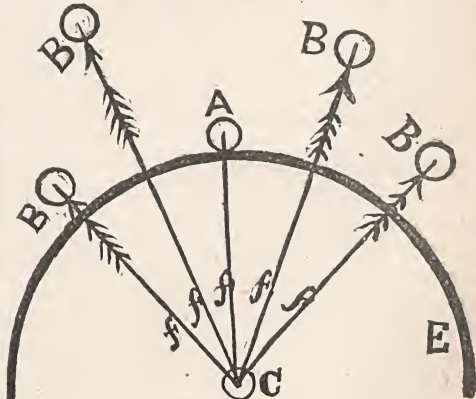
SCIENTIFIC ASSOCIATION.

THE work of scientific investigation is receiving a new impetus in many parts of the country, owing to the influence of *The Microcosm* in daring to meddle with authoritative landmarks of philosophy and science, as laid down in our text-books, and as taught in our colleges. Prof. Geo. Gowen, Flat Creek, Tenn., says:—

"A society of scientific professors and ministers of the gospel has been permanently organized here, for the sole purpose of discussing theories and explosions of theories contained in *The Microcosm* and *The Problem of Human Life*. We meet next Saturday night, when Prof. T. P. Brennan, Prof. J. L. Houston (County Superintendent of Public Instruction), Prof. W. Crigler, Prof. W. J. Hart, Prof. Wm. Henslee, Elders Reagor, Kirby, Floyd, and others, including your humble servant, will take part in the investigations. Yours, very truly, GEO. GOWEN."

We congratulate our friends who have thus proved to the world that they do not fear truth because it happens to be new to science. Let others imitate the worthy example.

A FOURTH LAW OF MOTION.



To the Editor of *The Microcosm*:—

He who, without the sanction of the schools,

ventures to advance any new idea or theory in science, commits an unpardonable offence against some close corporation of parrots, who chatter their lives away in retailing the ideas, experiments and deductions of others, and who are no more entitled to the credit of what they say or do than a bookcase is entitled to the merit of the volumes that crowd its shelves.

Some short time ago I ventured to propound the idea that we should have a fourth law of motion, inasmuch as the three perfected and formulated by Newton did not appear to me to cover all the points of the case naturally involved. In these three laws we are informed that a body at rest would remain so forever, unless impressed by some adequate, extraneous force; that a body in motion would move on forever in a right line unless similarly impressed, and that any alteration of its course would lie in the direction of the line of such newly impressed force; and finally, that among bodies, action and reaction are equal, &c.—that is, that a body strikes you just as hard as you strike it, &c.

Here we have these three laws, in substance; but it will be observed that they afford us no indication of the fact, demonstrated by the above diagram, that a body moving in a straight line varies its distance at every moment from the center of gravity, and consequently its weight. In this diagram, E represents the earth, and C the center of gravity. A shows a body in comparative rest on the surface of the earth, and B B B B bodies in different lines of motion, as indicated by the arrows. f f f f f are lines of gravitation leading from the center of gravity to these bodies, and *vice versa*. Now, if gravity is weight, and it diminishes according to the square of the distance from its center, obviously the ball A, if weighing two pounds when at rest on the plane of the earth's surface, would weigh less if occupying one of the positions shown by the balls or bodies B B B B. The only difficulty we have now to dispose of, is that of a body moving in a line concentric with the circle of the earth, and equidistant at all points of that line from the center of gravity. Here, however, we meet no difficulty whatever, as the tangential force, the resistance of the atmosphere, and the power of the earth's attraction constrain the body so moving to alter its weight at every moment also. Hence, we should, in my opinion, have a new law of motion, formulated thus: *A body is of uniform weight when at rest only.*

Very respectfully,

JAMES MCCARROLL,

133 East Sixteenth Street, New York.

We present to our readers, as above, Mr. McCarroll's *Fourth Law of Motion*, which caused some controversy two or three years ago in scientific circles. We will not offer any comments upon the law in the present number, though we may have something to say about it next month. We write at present to notice a very bitter criticism of Mr. McCarroll and his Law by Dr. P. H. Van Der Weyde, a noted scientist of this city, in the *Manufacturer and Builder*, of which he was editor, and in which he characterized the Fourth Law as an

"old error easily disproved by direct experiment; and, besides, utterly contrary to *all the principles of correct science.*" To show the Doctor's ideas of "correct science" he makes the following statement, for the information of the benighted discoverer of this alleged Fourth Law:—

"A cannon-ball when projected horizontally from an elevation *descends just as much every second of its flight as it would if simply allowed to fall perpendicularly*; that is, very nearly 15 feet in the first second, 45 in the second, 75 in the third, 105 in the fourth, and so on. The above will suffice to show that the author of that pretended law of motion has no knowledge of the elementary principles of natural philosophy, nor of mechanical science."

Now, it might be well to inquire whether Dr. Van Der Weyde is the proper man to charge a brother investigator with having "no knowledge of the elementary principles of natural philosophy, nor of mechanical science," after stating such a self-evidently false principle of philosophy as the one quoted above. We are prepared to show that there is no truth in the position thus taken by the Doctor—that a ball fired horizontally will fall toward the earth with the same accelerated velocity as if let drop perpendicularly; and although this statement, like many other "scientific" propositions, is in perfect accordance with the teachings of our text-books, Dr. Van Der Weyde ought, with a moment's reflection, to have known better; but for the fact that, like many other great scientists, he receives most of his knowledge of natural philosophy and experimental physics at second-hand, and is not able to shake himself loose from established authority sufficiently to do his own thinking. We have often seen evidences of this in his fulminations on "science" before the Polytechnic Institute of this city.

In order to enlighten the versatile Doctor, let us ask him what the *tangential force* of a projectile is for, when thus fired horizontally, if it is not partly to counteract gravity, and thus prevent the ball's falling as rapidly as it otherwise would? Here is an acknowledged *tangential force* constantly acting upon the projectile, tending to keep it in a rectilinear course against the power of gravity, which this learned savant and his philosophical authorities assert counts for nothing at all, since they tell us that the cannon-ball thus fired will approach the earth with exactly the same acceleration that it would had it been let drop perpendicularly. We deny this, in the face of all science; and have no doubt but that an honest experiment, made without the fear of text-books or authority before the eyes of the experimenter, will show that the rate of fall per second will

be in the exact proportion to the velocity with which the ball is discharged; and that, under any velocity, its tangential or projectile force will subtract an equivalent amount from its rate of fall by that much counteraction of gravity.

We will now demonstrate this proposition philosophically, backed by no less authority than Sir Isaac Newton,—who, though mistaken in some things, is nevertheless generally right in his philosophical conclusions. On page 513 of his “*Principia*” he gives a view of the earth, and as an illustration of firing projectiles from an elevation in a horizontal direction at different rates of velocity, with their effects. He shows that at a given velocity the ball will reach the ground in a curved path at a certain distance from the point of firing. At a higher velocity it might go half way around the earth before striking the ground. And at a still higher velocity, supposing there to be no resistance of the air, the projectile would fall only fast enough to keep pace with the curvature of the earth's surface, and thus would go entirely around the earth, passing the point whence it was fired. In such case, it is plain to see that the fall of the projectile would be at a *uniform rate of velocity each second, without any acceleration whatever*; and therefore that its tangential force would counteract gravity just enough to prevent this acceleration, and thus keep up the uniformity of its fall. Newton further shows that this projectile velocity may be supposed so great, and its tangential force so powerful, as to overcome gravity entirely, carrying the ball away from the earth into space, never to return! We do not deny but that Newton may have taught, in other places, the same view of natural philosophy laid down by Dr. Van Der Weyde. But we care not for this, as we are not responsible for self-contradictions by the greatest authorities. We cull for the truth alone, as we read them, and cheerfully concede correctness, wherever and whenever we believe them to be right. And further, we will not hesitate to acknowledge our own mistakes in science whenever we find ourselves to be wrong by more careful and thorough investigation.

In view of the foregoing argument, what becomes of Dr. Van Der Weyde's “elementary principles of natural philosophy”? Echo answers, *What?* Newton further shows that the moon's orbital motion is governed by the same law of falling bodies,—not when let drop perpendicularly, but when projected horizontally with a certain velocity. Hence, he utterly overthrows the scientific nonsense laid down in our text-books, copied by Dr. Van Der Weyde, that a horizontally projected body falls with

the same accelerated motion as if let drop perpendicularly. If the moon's fall toward the earth were suddenly to take on the acceleration claimed by scientists, we might soon look out for a lunar collision. But fortunately for us, and for scientists as well, we are safe from such catastrophe by reason of the true laws of motion having effect under action of the earth's gravity, thus keeping the moon in her orbit around the earth at a uniform rate of fall—which rate, corresponding exactly with the curvature of the earth, was originally imparted under the allwise dictation of One who gave to the moon its proper projectile velocity.

FUTURE DISCOVERIES.

THE marvelous achievements of science and invention in the past causes a thoughtful person to ask himself, What will the future probably develop? Certain it is that we have not yet come to the end of invention and discovery, judging from the increased reports of patented inventions in this and other countries. It may be regarded as a general truth, that, in all departments of investigation and research, the cultivation of one field only expands the view to other and wider fields, whose unbroken soil invites the scientific husbandman.

We have often reveled in the luxury of contemplating the revolutionary inventions and discoveries of the comparatively recent past,—such as printing-press, steam-engine, telegraph, photograph, reaping-machine, sewing-machine, telephone, electric light, phonograph, and a hundred others that crowd before the mental vision, and we have asked ourselves the puzzling question, What is there yet left to invent or discover, in science or the useful arts, that man really needs for his happiness? We love to ponder on this fruitful inquiry, and have often exercised our inventive thoughts for hours at a time in contemplating future possibilities, and in trying to conceive of some invention or discovery not yet achieved which might add to the comfort of mankind. We find no difficulty in conceiving of many such advances in science and art, which at present seem to defy the genius of the scientific inventor. We may name several of these in the future; but for the present will only refer to a single one.

The time is comparatively near when the coal-fields of the world will become exhausted. The rapidly increasing demand for coal for the purpose of warming and lighting, especially in cities, for various other domestic uses; for the generation of steam-power for innumerable manufacturing and other purposes, for our prodigiously increasing systems of railroads, and especially for ocean travel, seems now an unavoidable necessity, and one for which no

known source of fuel could form a substitute. Soon all these at present indispensable demands for coal will have to yield to the inexorable. Then, what will take the place of coal? Wood is also rapidly disappearing. Forests are melting away before the rapid advance of civilization (?), consumed for fuel, building, export, &c., with no new forests artificially taking their places. And even if wood were inexhaustible, it could not now meet the demands for various kinds of manufacturing purposes, and especially for ocean travel. Without coal, or its equivalent in condensed fuel, our ocean steamers would be forced to leave the seas and to give place to the uncertain sail and capricious wind, which would send civilization backward and paralyze the progress of the world as if all the railroads were wiped out of existence at a single sweep, and we should be forced to return to the old-time stage coach and the more snail-like canal-boat of our fathers. Will there, when this portending disaster to civilization shall culminate, then be some timely discovery made, by which to counteract this terrible set-back to the world's advancement? We believe there will; and we can see two fields open for the inventor and scientist in that direction.

1. There spreads out the limitless supply of hydrogen and oxygen gas,—a field as broad as the earth and as exhaustless as the ocean. It is not at all impossible but that a simple process may yet be discovered, by which these two gases composing water may be separated and then again brought together in producing, as is well understood, the most intense heat known to chemistry, and in this manner provide the means for generating steam-power for all the uses of commerce. Such a fuel-supply, without smoke or dirt and everywhere abundant, if cheaply decomposed, would revolutionize trade and manufactures and convert this world into a commercial paradise.

2. But another field, still grander and more wonderful, opens to the inventive mind in the exhaustless stores of electricity with which the earth, ocean, and atmosphere are surcharged. The universe, in fact, is but a storehouse of electricity; and all that is necessary, is to find out suitable means for availing ourselves of this endless supply of pure fuel. At present we know how to draw from this treasure, by means of dynamo-machinery, a supply sufficient for various important uses; but it costs in the expenditure of power more than the electric heat thus obtained will reproduce in steam. Is this state of things always to prevail? It seems to us not necessarily. For example, it requires but an infinitesimal fraction of the power to open the gate of an ex-

haustless reservoir of water, such as the Niagara River above the falls, compared to the motive force such current will yield in return when the open gate allows its torrent to fall upon the wheel. If we had first to pump the water into the reservoir, before using it upon the wheel, it would be a very different thing, and would be something analagous to our present use of electricity as a motive force. But may there not yet be invented an electric faucet, so to speak, by which to tap Nature's reservoir and thus turn on a torrent of electricity that would heat and light such a city as this, supply power to all her mills and manufacturing establishments, and run all her railroads, both surface and elevated? We do not believe this to be a utopian conception, by any means, but one of the near possibilities of our advanced civilization. The political economist may therefore quiet his alarm in regard to this country in particular and the world in general soon going to the everlasting how-wows by the giving-out of our supply of coal. The One who condensed the strata of carbon beneath our soil has generously provided two other sources of heat, light, and power, either of which, when the door of its secret archives has been unlocked by science, will as far surpass our coal-supply as the light of the sun surpasses that of the voltaic arc, or as the brilliancy of the latter outstrips the sickly glow of a tallow dip. The reader of this may yet live to cross the Atlantic Ocean in four days in a magnificently illuminated steamship, lighted, propelled, and warmed by the combined supply of electricity, and oxygen and hydrogen gas, the one drawn from the air and the others from the ocean. But more anon.

OUR OWN PORTRAIT.

WE are receiving urgent letters from many of our subscribers, and from purchasers of *The Problem of Human Life*, requesting us to put our own portrait into some number of *The Microcosm*, that they may see how the editor looks. Rev. D. Todd Jones, Shenandoah, Pa., writes:—

"Very nearly all of your subscribers here have desired me to ask you to place a portrait of the author of *The Problem of Human Life* in the next edition of the book, and in an early number of *The Microcosm*. They are very anxious to see what manner of man he is. I must confess that I share in this general desire, as I have long wished to see the face of the man who is revolutionizing the scientific world."

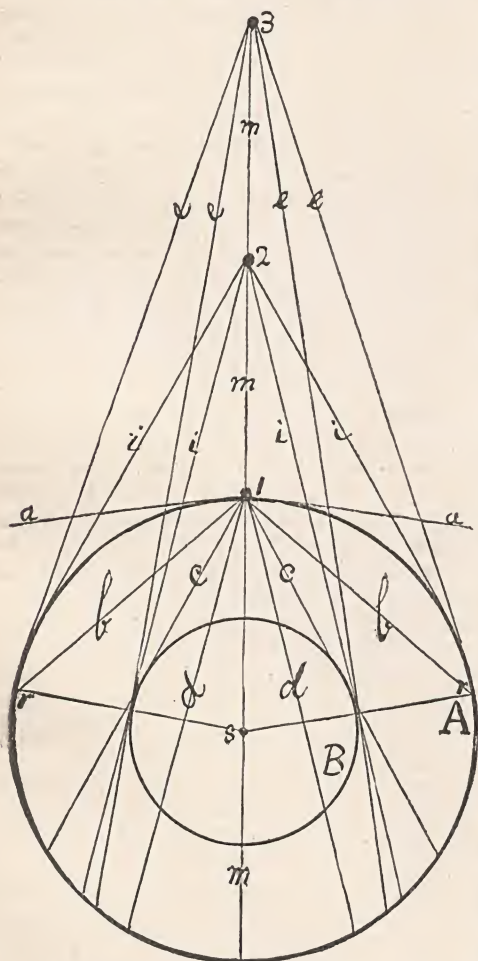
Another minister writes:

"You have shown us the faces of six men who were developed from monkeys. We now want to see *one man that God made*."

Well, to tell the truth, we have hitherto de-

clined to comply with these urgent appeals of our friends, alone from a feeling of *modesty*. As proof that this is one of our characteristic attributes, we have only to refer to the above extracts! But we have decided to "throw modesty to the dogs," and hereby announce that in the first number of the next volume of *The Microcosm*, as a frontispiece, will appear our own likeness, as good as it can be engraved. And as *honesty* is also one of our attributes, we are forced to confess that this is partly a *dodge* to induce the subscribers, who are so anxious to see our picture, to continue to take *The Microcosm* and to pay the dollar promptly in advance for the new volume. So begin to save up the pennies, as you may expect a treat!

NEWTON AND GRAVITATION.



IN last month's *Microcosm* we prepared the ground for the present paper on Gravitation. In that article we denied the correctness of Newton's fundamental law, namely, that the attraction of the earth exerted upon bodies at

or above its surface, varies inversely as the square of the distance from the center; or, which is the same thing, in the language of Newton, "as if that whole attracting force issued from one single corpuscle placed in the center of this sphere." (*Principia*, Prop. 75.) We therefore charged that the assumption of Newton, and its acceptance by astronomers, that the radius or semi-diameter of the earth (4,000 miles) is the proper unit for calculating the decrease of the earth's gravity from the center, and consequently for estimating the true weight of bodies on or above the earth's surface as far away as to the moon, is pure guesswork; and we asserted our belief that it could be shown to be a prodigious scientific fallacy, self-evidently false on its face, and contradicted by Newton himself. It remains, in the present paper, for us to prove these charges true; and to make the proof so plain that children who read *The Microcosm* may clearly understand how and why Newton was mistaken.

To show the reader, first of all, that we have not misrepresented Newton's fundamental law of Gravitation, we here quote a sentence from Rev. Dr. Goodenow's letter, which we printed last month, and which he partly quotes from Herschel, merely reminding the reader that Dr. G. is good authority, having written a work on Gravitation, in which Newton's law is, of course, his base. He says:—

“At the surface, for the average of *all the particles attracting*, the distance is the *radius* of the sphere. He [Newton] goes on to prove this is so *at any point farther off*, say *two radii* distant, or sixty to the moon. But if less than one radius be taken, due allowance must be made from the value given by this law, *which treats the sphere as if all condensed at its center, as indeed it is gravitally to bodies outside of it.*”

Now, we can make no mistake in regard to Newton's law, as here correctly expounded by a learned mathematician and astronomer. A body "outside," or on the surface of the earth is attracted toward the center, according to Newton, with the same force precisely as if the whole attraction of the earth were "condensed at its center." Hence, that the same body, removed "two radii," or 8,000 miles from the center, would weigh exactly *one fourth* as much as it does on the surface. If removed three radii, or 12,000 miles from the center, it would be reduced to *one ninth* its weight on the surface; and if removed sixty radii (the distance of the moon, or 240,000 miles from the center of the earth,) it would weigh but one 3,600th as much as the first radius on the surface of the earth. This is the teaching of Newton, and of all astronomers: but is it true? We answer, emphatically, *It is not*, as will at once

be seen by reference to our diagram, and by aid of a few words of explanation, notwithstanding it has been thus formulated over and over ten thousand times as many different mathematicians, since Newton first laid down the law in his *Principia*.

The very first true and self-evident principle of Gravitation, which Newton admits in many places in his *Principia* (see prop. 74, cor. 3), is that any given corpuscle of matter attracts any other given corpuscle with a force reciprocally as the square of their distance from each other. Now, it will be seen by reference to our diagram, that this true principle of the mutual attraction of corpuscles, decreasing in force as the square of their distance, flatly contradicts Newton's general law of gravity. Suppose the outer circle (A), to represent the earth as it now is, 8,000 miles in diameter, and the inner circle (B), to represent the same earth condensed to one half its diameter, but still retaining its full attractive force. For the present we have no use for this inner circle; but will confine our argument to the earth as it now is, with a radius of 4,000 miles. Then, suppose a given body to rest on the earth at 1, it is evident that, according to the principles of gravity, the corpuscles of the whole earth must attract it in straight lines toward each, and with a force varying inversely as the square of the distance between the body 1, and each of said corpuscles. This being a mathematical truth, admitted by Newton, it is plain that these myriad pulls of the different corpuscles of the earth upon the body at 1 cannot be in the direction of the earth's center *s*, but must be in straight lines toward the various parts of the earth's mass, as shown by the lines *a a*, *b b*, *c c*, and *d d*. In this manner the attractive force of the whole earth is exerted upon the body at 1 to a disadvantage, more or less according to the angle of pull, with the exception of a single row of corpuscles passing through the center of the earth on the line *m s*. It is plain, by a glance at the diagram, that a portion of the earth's mass attracts the body at 1—east, west, north, and south—almost horizontally, as seen at the lines *a a*; but as all this portion of the earth draws slightly downward and equally in all directions round about, the average or general pull (what little downward tendency it has) is toward the center *s*. Yet it is plain that the attraction of the body at 1 by all that vast portion of the earth outside of the lines *b b*, embracing about a hundred million cubic miles, exerts but about an average of one quarter to one third of its full attractive energy on the body at 1, so far as causing it to descend toward the center. The reason for this is evident, since the attractive force of

this part of the earth is largely neutralized by opposite attractions. Were the attractive force of all this portion of the earth exerted directly downward, and thus added to the weight of the body at 1, by being applied on the line *m s*, as Newton teaches, instead of in nearly contrary horizontal directions, it need not take a mathematician long to see that the body at 1 would be largely increased in weight. The same thing is true of the angles of pull between the lines *b b* and *c c*,—taking in, as they do, another large portion of the earth's mass. A child ought to see, by looking at our cut, that much of the attractive force of this portion of the earth is neutralized and lost upon the body at 1, so far as causing it to descend toward *s*; yet it is plain that the general tendency of such pull is in that direction. The fact that all bodies really tend toward the center of the earth in falling, no doubt deceived Sir Isaac Newton and misled him to suppose, impossible as it seems to be, that the entire attraction of the earth acts upon a body outside of it as if the force were "all condensed at the center"! whereas two little boys at *r r*, with ropes attached to their sled at 1 (supposing our diagram to represent a horizontal plain) would know that they could not pull as heavy a load with their ropes separated on the lines *b b*, as if they should come together at *s* and pull in one direction with the same force; though they would know intuitively that their united pull at *r r*, if they both drew equally, would tend to bring the sled toward *s*. Yet Newton in effect tells in his great work on gravitation that the two boys at *r r* pull the sled toward *s* with the same force precisely as if they were the first to come together at *s*, and then pull with the same united energy! This is no misrepresentation of Newton's laws of the central attraction of spheres exerted upon bodies "outside" of them; for he and his followers distinctly teach that the various correspondingly opposite parts of the earth at *r r*, attract the body at 1 as if the sphere were "*all condensed at its center, as indeed it is gravitally to bodies outside of it*"!

Hence, as this fundamental law of gravity is contradicted by Newton himself, as already shown by his teaching the direct and reciprocal attraction of corpuscles as the square of the distance, we have only to ask the reader carefully to note the angles of pull upon the body at 1 by the different portions of the earth's corpuscles on the various lines *a a*, *b b*, *c c*, and *d d*, and he will observe that but little if any more than half of the earth's real attractive force is applied effectively in bringing this body toward the center, *s*. Hence, the conclusion is irresistible that if the entire attractive

force of the earth could be exerted as if condensed at *s*, as Newton teaches, the body at 1 should absolutely weigh nearly twice as much as it now does! This being true, the radius of the earth (4,000 miles) manifestly has nothing to do with determining the true decrease of the weight of a given body, should it be removed farther away from the earth's surface. This proposition is so plain as to scarcely need an argument.

Suppose, however, the body at 1 to be removed another radius, and placed at 2 (4,000 miles from the earth's surface), is its weight reduced thereby to *one fourth*, as this law of squared distance requires? Not by any means; because the angles of the pull, as seen by the lines *iiii*, have been brought much nearer together, and made to approximate much more nearly the direct line, *ms*. Instead, however, of reducing the weight of the body at 2 to *one fourth*, such removal would reduce it but little if any below *one half* of its weight at the surface. A tyro in mathematics can approximately calculate this by considering the manifest difference in the angles of pull, as exerted by all parts of the earth upon the body placed first at 1, and then at 2. No one can fail to observe the immense proportionate advantage of pull by all portions of the earth's gravity upon the body when at 2.

The same also holds good with the body removed another radius, as seen at 3. The angles of pull, on the lines *eeee*, toward all portions of the earth, becomes still more acute, and tend still more nearly to the center *s*, which demonstrates that the *proportionate* weight of the body, instead of varying according to the law of inverse squares, continuously improves from 1 to 2, from 2 to 3, and so on, in consequence of this change of angles indefinitely to the moon; that is to say, its weight does not decrease so rapidly as this law requires, but keeps all the time greater than if diminished by employing the radius of the earth as a unit, as Newton so singularly miscalculated. But at a great distance from the earth, as at the moon's orbit, for example, it is manifest that the apparent diameter of the earth becomes very small and of trifling account, and consequently the angle of pull is so acute and so nearly direct to the earth's center, that the difference between this and absolute central attraction does not materially affect the calculations of astronomy. But while it affords sufficiently accurate data for astronomers, it involves the essential mathematical truth that, since a body on the surface of the earth has but about one half of the actual weight to which it is entitled by virtue of the entire attractive force of the earth pulling downward in a central line, it posi-

tively demonstrates the moon's weight to be about twice as great as calculated by Newton, or as his law requires, since he estimates the moon's gravity or weight by the weight of bodies on the earth's surface, and alone on the false supposition that such body would decrease fourfold in being removed one radius (4,000 miles) from the earth's surface, or 3,600-fold in being removed 60 radii, or the distance of the moon! As a body on the earth's surface weighs but one half as much as it would by virtue of the whole attractive force of the earth pulling in one way, or directly downward (as Newton mistakenly supposed it did); and as it therefore can be reduced only about one half in weight, instead of fourfold, in being removed 4,000 miles upward, owing to this change of angle toward the center, it follows that the radius of the earth as a unit has nothing whatever to do with the ratio of the decrease of the earth's gravity at various distances above the surface. Hence, as before remarked, it demonstrates the moon's weight to be about double as great as Newton calculated.

Now, may not this prodigious error (which grew unavoidably out of Newton's original mistake about the earth's gravity as if it all proceeded from its center) yet prove the key in the hands of some able mathematician for explaining the peculiar motions of the moon, which confessedly are not explicable by any known laws of astronomy? Newton recognized these inexplicable motions of the moon, and frequently refers to them in his *Principia*. He says:—

"Besides those inequalities taken notice of by astronomers, there are yet some others, by which the moon's motions are so disturbed that hitherto by no law could they be reduced to any certain regulation."

Again:—

"But there are yet other inequalities not observed by other astronomers, by which the moon's motions are so disturbed that to this day we have not been able to bring them under any certain rule." pp. 414, 533.

How could it be otherwise, when the very law of gravitation itself was radically false, and by means of which the moon's weight was miscalculated one half? As a matter of course, if the moon weighs double as much as astronomers, under the lead of Newton, suppose, its attraction by the sun and earth must differ considerably from their calculations. Thus Newton's original mistake in the law of gravity has involved the entire solar system in miscalculation and consequent error, since the weights of the planets, as well as of their satellites, have been estimated on the basis of the mistaken weight of our moon, and it upon the mistaken weight of bodies upon the earth's

surface! What the achievements of astronomers would be, working among the moons of Jupiter and Saturn, and now of Mars, with the basis of their *true* weight combined with their observed motions as their guide, we are unable to predict, but we do not hesitate to believe that valuable contributions to the science of astronomy would very soon be recorded. Indeed, we may safely believe that whenever the true effect of the earth's entire gravity, as exerted upon bodies at the surface is understood, which would make all such bodies about double their present weight, and which would correspondingly augment the actual weight of the moon, then, and not till then, can astronomers have a basis upon which to account for the irregular motions of that luminary, which confessedly no known law now explains. No body of a certain assumed weight can be expected to move in space, under the various attractions of sun, earth, and other planets, in all respects according to formulas laid down, when these very formulas have been based upon a mistake of one half in estimating the real gravity of such a body.

Now, since the body at 1 receives but about one half of the effective pull of the earth's gravity by which to produce weight, in consequence of the partly contrary angles at which much of this force is exerted, and as such body is therefore only about one half as heavy as it would be if the earth's entire gravity was exerted on the line *ms*, as *Newton* mistakenly supposed it to be, it follows, that instead of decreasing to one fourth (as the law of inverse squares requires), by moving it 4,000 miles, as seen at 2, it would have to be removed about 7,000 miles, or nearly to 3, in consequence of the rapid gain by gravity through the change of angle toward the earth's center as the body ascends. The next remove, in order to reduce its weight to one ninth, as the law requires, would be about 6,500 miles further on, as nearly as we can guess; and in this manner, instead of any fixed unit, such as the radius of the earth, for determining the ratio of decrease, each remove and each unit would vary, becoming less and less as the angles of pull became more and more acute, until at the distance of the moon (240,000 miles), the extreme lines of angle touching the earth would fall so nearly together that the diameter of our planet, as before remarked, would become inconsequential in astronomical calculations, though it would leave a body thus removed to the moon's orbit nearly double the proportionate weight it would have possessed had the decrease of gravity from the earth's surface varied inversely, according to *Newton's* law of squared distance from the center. In a word, that no

possible misunderstanding of our position may exist in the reader's mind, we state it in these explicit terms: As the body at 1 is attracted in various diagonal and partly opposite directions, as well as downward, much of which diagonal attraction is neutralized by contrary pulls, it follows that the body at 1 is *really attracted by about twice as much gravity as is converted into weight*. But as the same body, removed to the moon, would be attracted by the entire gravity of the earth in *substantially a central direction, thus converting this entire attractive force into weight*, it follows that the weight of the body, thus removed to the moon, would be double as great as *Newton* calculated by the inverse square of the earth's radius, because at the surface only half of the earth's gravity is converted into weight, while at the moon it is all thus converted.

We readily admit that two spheres, of equal size and of homogeneous structure throughout, would reciprocally attract each other as if their attractive force were all condensed to a single point in the center of each sphere. The reason for this is plain. Each corpuscle in one sphere attracts the corresponding corpuscles in the other sphere reciprocally as the square of the distance between them; and as all the corpuscles of one sphere attract, and are in turn attracted by, all the corresponding corpuscles of the other sphere mutually and reciprocally, the average attraction of all the corpuscles of both spheres, they being of the same size, will be in effect as if each sphere were concentrated to a single corpuscle at its center. But this is only supposable when the two spheres are of the same size and of equal homogeneity throughout. *Newton* speaks of this mutual attraction of spheres without the slightest distinction as to the difference in size, whether or not one is as large as the earth and the other no larger than an apple. Of course, as seen in our diagram, this law of estimating from the center is far from accurate the moment one body is smaller than the other.

But, as further evidence of *guesswork* on the part of *Newton*, how did he know but that the earth is a hollow globe, with half or more of its interior diameter void space? Such a state of things is not only possible, but probable, and that a large portion of the earth's interior, if not empty, is devoid of ponderable matter, since the tendency of revolving bodies is to throw fluid or molten substance toward the surface by centrifugal force. Suppose that portion of the earth's interior, within the circle B, for example, to be empty space, it would augment our case nearly one half against *Newton's* law, because the body at 1, would, in such case, have less than one third the weight to

which it is entitled by virtue of the whole attractive force of the earth, since much of its attraction would be removed from a central pull to a disadvantageous angle from all sides round about. To a mathematician and philosopher, this needs no elaboration.

On the supposition that the earth is a hollow sphere, and consequently that the body at 1 has but a third the weight it would possess if Newton's law were true, then the moon must possess fully three times the gravity and attractive force estimated by Newton. How, then, we ask again, could it be otherwise than subject to many inexplicable motions, under such enormous misconception of its real weight and attractive force?

As proof that Newton estimated the weight of the moon by the apparent and not real gravity of a body on the earth's surface, we have only to read his words on page 392 of the *Principia*, in which he says the gravity or weight of a body "at the surface of the earth is 60x60 [3,600] times greater than at the moon," thus basing his calculation of decrease alone on the radius of the earth as the proper unit, or 60 radii (240,000 miles) to the moon! This supposition, that a body on the earth's surface receives the entire gravity of our planet in a central direction and thus decrease in weight, in being removed from the earth as the square of the distance from the center, was, we think, the cardinal mistake which led Newton to adopt the unit of the earth's radius, and in this manner to miscalculate the true weight of the moon, as we have tried to show, by about one half. So far from the figures quoted above being correct, the weight of a body on the earth is shown by our diagram to be only about 1800 times greater than at the orbit of the moon, instead of "60x60," because a body at that distance would receive all the earth's gravity in nearly direct lines toward the center of the earth, while on the surface it manifestly receives but about one half of its effective pull, as already urged, owing to the partly contrary angles at which it is exerted. Hence, also, it follows that Newton's law of falling bodies (15 feet the first second, 45 the second, 75 the third, and so on,) is wrong,—not a universal law, but merely local,—and does not extend in principle to the moon! This is plain: because a body on the surface of the earth falls with a velocity *exactly in proportion to the effective force of the gravity exerted toward the earth's center*. But, as Newton, according to our argument, miscalculated the amount of this force one half, it follows that a stone should fall 30 feet the first second, if his law were correct; that is, if the earth really attracts bodies on its surface as if its entire force of gravity acted in a central line downward.

It is plain, also, that the law of pendulum-motion must share the fate of the law of falling bodies by the refutation of Newton's fundamental proposition. If the whole attractive force of the earth's gravity took effect in a downward and central direction, instead of scattering in various contrary angles of pull, it is manifest that the pendulum would behave very differently from what it now does, and the rod would possibly require to be twice as long as at present, in order to beat seconds!

We have not, in this argument against Newton's law, taken into account the attraction of our atmosphere, which is exerted in an opposite or upward direction upon a body at the surface of the earth. Although this is but little, it is nevertheless a small factor in addition to the other considerations against Newton's unit of the earth's radius.

We submit this reasoning to fair-minded investigators, and would be glad to have the views of mathematicians as to the merits of our criticisms of Newton's 75th proposition. A few cheap critics like Prof. J. K. Macomber, B. S. (Bad Specimen), of the Iowa Agricultural College, may effect to sneer at the idea of calling into question Newton's propositions, while innocently criticising our "ridiculous blunders" (which were purposely thrown out as baits to call such shy fish to the surface, to be publicly speared), but real scientists will begin to suspect that we probably knew that Newton never taught such "prodigious nonsense" as that a body at two feet from the earth weighs but one fourth as much as it does at one foot, and that a grocer should be careful at what distance from the earth he holds his scales! They will also gravely suspect that we probably know the difference between calculating the inverse square from a central point and beginning the calculation one hundred or one thousand feet away! Those who do not yet suspect this, may waste their ammunition *ad libitum* for another twelvemonth firing at our "dummies," and if in the mean time they will read *The Microcosm*, they will find out.

In conclusion, if *The Christian Standard*, which so kindly copied our former article upon this subject, or any other paper, should wish their readers to have an opportunity of investigating this matter of gravitation and Newton's laws understandingly, it has full permission to copy this article; and to aid such editors, we cheerfully forward by mail, free of charge, an electrotype copy of our illustrative diagram.

MICROCOSMIC DEBRIS.

THE tobacco monopoly of France last year

yielded a net profit to the State of about \$60,000,000.

Tramways are projected between many villages in Italy on the road built by the old Romans.

It is announced on good authority that the British Government has decided to buy up the telephone companies in Great Britain.

Nearly \$10,000,000 was taken from the mines of Utah last year, and a bullion product of \$13,000,000 is predicted for the present year.

The electric light is to be tried in Bristol, England, and the tidal motion of the Avon and the Severn is to provide the necessary motive power.

About 80,000 acres of land between Jaffa and Jerusalem have been secured, on which to form a colony for the persecuted Jews of Europe.

The monument to Edward I. on Burgh Marsh, in England, the scene of his death, has just been carefully restored at the expense of Lord Lonsdale.

It is asserted that no man of the period has been more worshipped by women than the Abbe Liszt. They bribe his servants for his old gloves and other tokens of him.

The number of postcards dispatched in Germany during the year 1880 was 123,000,000. In the Post Office Museum at Berlin there are exhibited 418 different kinds of postcards.

Nevada used to send out wealth; now it is taking it in. All the mines in the State yielded during 1881 about \$4,500,000 less than enough to pay the cost of operating them.

Australia, with a revenue of over \$30,000,000, has a surplus of \$1,000,000 for last year; and the Treasurer announces that no further foreign loans will be needed for many years.

Nearly 1500 of the 3,630 streets of Paris have, during the last thirty years, had their names changed, chiefly for political reasons. This must involve infinite trouble to the residents.

France and Italy have hitherto produced sugar only from the beet-root. The sugarcane has lately been introduced into both countries, and its rapid growth threatens the beet-root industry.

The war-footing of the German army has been established by the budget of 1882 at 500,000 men. In the event of war, the number could be doubled at twenty-four hour's notice by telegraph.

During the past year 2,030 vessels were wrecked, and property estimated at \$1,400,000,000 destroyed. Add to this the property

lost in fires, and see what an appalling amount of capital is utterly lost.

The census returns in France show the following results: Lyons, 332,894; Nantes, 121,955; Rouen, 104,721; Havre, 103,063; Douai, 73,900; Alger, 64,714; Grenoble, 50,967; Bordeaux, 221,520.

Prof. Huxley says that persons who have taken an active part in science should be killed at sixty, as not being flexible enough to yield to the advance of new ideas. He is himself nearly fifty-seven.

An English statistician calculates that every man on an average speaks fifty-two volumes of 600 octavo pages per annum, and that every woman yearly brings out 520 volumes of the same size in talk.

A collection of letters written by Voltaire to the private Secretary to the Empress Catherine will shortly be published. They were recently discovered hid away in the library of a Russian country-house.

The Empress Eugenie is at present living in a small house within the grounds of Osborne, in the Isle of Wight, and is visited daily by Queen Victoria, who has proved a devoted friend to the afflicted lady.

The German Government intends to attach architects and engineers to its legations abroad, with a view of being kept informed of the improvements and inventions which may occur to foreign countries.

The rich Greek banker, Syngros, has contributed another 100,000 francs for the foundation of a National Archaeological Museum at Olympia, where the relics of antiquity recently discovered are to be exhibited.

It is said that the railroad-offices in Austria employ upward of three thousand women. They receive a salary of from \$5 to \$30 per month. They are invariably the near relatives of dead or active male employees of the road.

It is stated that the results of recent geological explorations made in Russia by official direction show the existence in that empire of phosphate deposits sufficiently extensive to supply the wants of Europe for an indefinite period.

An important patent has been taken out by a Russian of the name of Dittmar for solidifying petroleum into a substance like wax. It is contended that the dangers and difficulties of the transport of petroleum will thus be overcome.

About a thousand million dollars of our national debt have been paid since the war ended. France has now nearly treble our debt, and

Great Britain more than double. Even Spain has a bigger debt than that which remains of ours.

During the past year 1532 persons died in London of the smallpox. Of these, 325 had been vaccinated and 637 neglected that precaution, the remaining 570 being doubtful. Of the population of London, 3,620,006 are vaccinated and 190,000 are not.

A puzzle for Orientalists has turned up in the shape of an inscription in an unknown character, not Phœnician, nor Cypriote, nor Lycian, nor Hamathite, which has been found on a contract tablet from Babylon, dated in the reign of Artaxerxes.

In a small grove near Cincinnati an army of crows take shelter every night. They assemble by thousands just before dark; and an old man living near the place says that to his personal knowledge the same grove has been their dormitory for sixty years.

The English Roman Catholic Directory shows 38 peers, 47 baronets, 6 Privy Councillors, and 56 M.P.'s, of whom 11 represent English constituencies. Within twenty-five years the number of Roman Catholic clergy and churches in England and Wales has doubled.

There exist in the Bengal Presidency 111 vernacular papers, with 36,000 subscribers. Forty-five of these, with a circulation of 20,000, are published in lower Bengal, and the remainder in the northwest provinces, the Punjab, Central India, and Rajpootana.

The venom of serpents is said not to differ chemically from human saliva, however powerful are its effects. Ammonia, long thought to be its antidote, does not render it innocuous. The poison when mixed with ammonia kills precisely as though it was pure.

During the year 1879-80 there were exported from New Orleans 6,000,000 gallons of "pure olive oil," extracted from cotton-seed, of which eighty-eight per cent. was sent to Mediterranean ports. Half of this amount went to Italy, the home of the genuine olive.

New fashions for ladies were set in the last century by dressing dolls in the prevailing mode and distributing them over Europe. The custom is believed to date from Venice, where the Government rigorously regulated dress by means of a doll set up as a pattern.

A San Francisco paper illustrates the cheek capacity of the California squirrel, by saying that one of them, killed the other day while carrying away wheat from a warehouse on the San Joaquin River, was found to have 1,803 grains of wheat stowed away in its mouth.

Water-courses were left out of the reckoning when grants were made for the 200,000,000 acres of land reserved by Texas for the use in developing her resources; and now, though the books indicate that there are 160,450 acres still left, there is a deficiency of over 2,000,000 acres.

Statistics disclose the fact that of every ten children born in England and Wales, less than seven ever reach their twentieth year. In France only half the children who are born attain that age; and Ireland falls even below this miserable standard of juvenile healthfulness.

The silk-trade of Lyons occupies some 120,000 looms, of which only 30,000 are within the city. Including those who work in the silk-worm establishments there are 800,000 persons employed in the Lyons silk-trade. In 1787 there were but 80,000 workers, and 18,000 looms.

The report of the Roman Board of Statistics shows that on the night of the 31st of December, 1881, the population of Rome and her suburbs numbered 167,627 males, and 132,965 females,—a total number of 300,292 souls. The increase of the population in the last ten years has been 52,416.

Mr. Mulhall, of the Statistical Society of London, estimates the amount earned by commerce, manufactures, mining, agriculture, carrying, and banking, in Europe in 1880, at £7,683,000,000, showing an increase for Great Britain of £337,000,000, against £1,218,000,000 for the rest of Europe.

India possesses a coal-bearing area of 30,000 square miles; and yet twenty years ago she was unable to supply the wants of a single line of railway. Last year, however, she furnished 500,000 tons, which was equivalent to half the total demand of all the railways and factories in the country.

The Duke of Argyle has received a present of wild turkeys from America, which he intends to try and breed at Inverary. The Duke of Cumberland tried to introduce them into Windsor Park; and in the reigns of George I. and II. there were flocks in Richmond Park, but the breed became extinct.

The question whether Noah Webster ever taught a singing-school in Baltimore has been, after a thorough and somewhat excited discussion in that city, decided in the affirmative. He became pressed for money while on a journey to Washington, and stopped long enough to fill his purse in that manner.

All persons entering the public house at Bristol, England, were counted one Saturday

night between the hours of 7 and 11 o'clock. Out of a population of 206,000, 105,000, or more than one half, entered the public houses in four hours. Of this number 54,070 were men, 36,803 women, and 13,415 children.

It is proposed to light up the greater part of the Suez Canal by electricity, with the twofold object, first enabling dredging operations to be carried on at night instead of during the day; and next, in order that vessels may pass through at all hours, instead of blocking up the passage and anchoring as hitherto.

It is thirty years since the cable between Dover and Calais was completed. The first message was handed to Prince President Louis Napoleon on Dec. 31, 1851. Prior to the message an electric shock fired a gun to salute the Duke of Wellington, then at Dover for the last time as Lord Warden of the Cinque Ports.

So microscopically perfect is the watch-making machinery now in use, that screws are cut with nearly 600 threads to the inch,—though the finest used in the watch has 250. These threads are invisible to the naked eye, and it takes 144,000 of the screws to weigh a pound, their value being six pounds of pure gold.

The recent death of Mr. James Wyllie, the tenant of the farm of Mossiel, near Mauchline, Ayrshire, is noticeable from the fact that he occupied for forty years the land which Burns tilled, being the second tenant after the poet and his brother Gilbert. It was while at Mossiel that the bard wrote some of his finest productions.

Judge Fornander, for 34 years a resident of one of the Hawaiian Islands, believes that the natives are not of American descent, as originally supposed, nor Malay or Mongolian, as most authorities have agreed, but Aryan; and he sustains this view by arguments derived from philology, traditions, and physical resemblances.

An electric-light machine drew many visitors at Louisville, and they intruded upon the workmen in an exasperating way, wholly disregarding the "no admission" placard. By hitching wires to the metal door-knob, and turning on a powerful current, the men secured the desired seclusion, and the intruders were dreadfully shocked.

The Duke of Westminster is thinking of using his power as a landlord to induce the tenants under him in London to consume their own smoke. He has sent out a private commission to investigate the matter, and if they report favorably, it will probably be made one of the conditions of a Westminster lease that one's chimneys emit no smoke.

Prof. Edward C. Cope, the Philadelphia geologist and palæontologist, thinks he has discovered a "missing link." In the tertiary formation of the Big Horn valley, Wyoming, he dug out the skull of a species of monkey which exhibits human characteristics in miniature, and is vastly superior to the monkey skulls of the present day.

One of the best night clocks in existence is at the Horse Guards' building in London. The light, known as the Bude Light, is not within the clock, but is thrown upon it just as that of a bull's-eye lantern is thrown on a dark corner. The light was invented by a Cornish *savant*, Sir Goldsmith Gurney, who called it Bude after his native place.

There are only 113 works in the English language which the blind can read. Producing books in raised letters is very expensive; and, of course, the sales are small, so that their publication is a matter of charity. The Perkins' Institute of Boston has almost raised a fund of \$100,000, with which they will issue twelve books a year indefinitely.

A remarkable use is being made of potatoes. The clean peeled tuber is macerated in a solution of sulphuric acid. The result is dried between sheets of blotting-paper, and then pressed. Of this all manner of small articles are made, from combs to collars, and even billiard-balls, for which the hard brilliant white material is well fitted.

The classified directory to the London Metropolitan Charities show their income to amount to over \$26,000,000. Four Bible Societies have a total income of \$400,000; fifty-six home missions \$2,350,000; twenty-three foreign missions, \$4,000,000; twenty-three charities for the blind, \$265,000; 163 pensions and institutions for the aged, \$200,000, &c.

A rich copper-mine has been rediscovered in the vicinity of Tucson, Arizona, within a few weeks. Nearly fifteen years ago it was first found; but the men who located the claim were driven from the mountains by hunger, and neglected to take accurate bearings of the spot. Since then several prolonged attempts to find the deposits have failed.

In education, as in most other respects, British Burmah appears to be the most progressive province of India. With a population of under 4,000,000, it had, during 1880-81, forty-eight government schools, 3,219 aided and private schools, with an aggregate of 88,707 scholars. The year, compared with the previous one, shows an increase of 8,261 scholars.

A well-known antiquary has discovered in an Athenian monastery a papyrus which is noth-

ing less than a MS. of the Iliad written about the year 308 B.C. The writer of this treasure was an Athenian named Theophrastus. Andronikus, the nephew of the last Byzantine Emperor, Constantine Palæologus, took it with him to Mount Athos when he went there to end his days.

Playing upon the violin is claimed to cure nervousness. The longevity of musicians has been estimated or averaged, and places the performers on the violin in the lead, sixty-seven years. Pianists come next, at an average of sixty-five years; composers, sixty-four; performers on the cornet, flute, and clarionet, at sixty-three; and the lives of singers average sixty-six years.

The London *Economist* remarks that it is characteristic of the length of time it takes to set the Government of India in motion on a new line of action that the proposal to grow tea in India was made fifty years before it was carried out. Sir Joseph Banks suggested it 1788, and in 1838 the first India tea reached London. The importation exceeds 42,000,000 pounds.

The Institute of Science and Letters at Milan has decided upon opening an important competition, the object of which is to produce a satisfactory life of Leonardo da Vinci, about whose career so many doubts and discussions arise nowadays. The prize is 5,000 lire (\$1,000), and the time allowed to competitors is four years. The work can be written in Latin, French, German, and English.

The number of publications issuing from the French press last year is officially stated to have been 18,717. These include pictures, maps, music, and photographs; but the books and pamphlets nevertheless number 12,261, which is more than double the number of publications ordinarily appearing in Great Britain. These figures show some falling off compared with the preceding two years.

The Vesuvius Railway having been successfully accomplished, it is now proposed to make the ascent to the crater of Mount *Ætna* in Sicily equally easy by a similar plan. A company has been formed at Palermo for carrying out this project. The railway will reach almost to the summit of the mountain, whence a fine view can be had of Sicily, Malta, and a portion of the southern end of the Italian peninsula.

According to a German economist, the income of the world is \$13,520,000,000; debt, \$10,926,000,000; taxes, \$2,002,000,000; capital, \$85,612,000,000. Sweden has the smallest debt, or \$50,000,000; France the largest, or \$2,140,000,000. The United States has the largest in-

come, and England the most capital. Italy is the heaviest taxed, paying 35 per cent of its income for taxes to the average 15 per cent. of the other nations.

Of the considerable number of boys sent to Virginia by the Children's Aid Society of New York, comparatively few, it seems, have turned out well. Many have run away, to take up the vagrant life of the cities; some have got into jail; others were discharged by their employers; some few adapted themselves to the rather harsh requirements of farm life, and have attained good positions as overseers, superintendents, &c.

Statistics show that Paterson, in proportion to its size, has more one-eyed men than any other city in the United States except Pittsburgh. Nine tenths of those thus afflicted are workers in iron and steel, and have been struck in the eye with the metal clippings. The glass-eye manufactures have such a thorough system of information that before the bandage is off an injured eye its owner is the recipient of many circulars.

Steam vessels for whaling have proved highly profitable. The first one ever sent out from the Pacific coast was the *Mary and Helen*, which cleared last year enough to pay her entire cost and \$40,000 besides. The second venture, that of the *Belvidere*, has just come back from a voyage of only six months with \$100,000 worth of oil above the investment. The great success of these steamers is likely to revive the business of whaling.

A popular penitential pilgrimage of Jerusalem is announced by the religious journals of Paris. The pilgrims are to embark at Marseilles on the 27th of April. At Jaffa carriages, horses, and asses are to be in readiness, by means of which the journey will be continued to Jerusalem, where wholesome and sufficiently abundant provisions are promised at low prices. From Jerusalem excursions will be made to all the spots associated with sacred history.

Denmark possesses at the present moment not only the best torpedo-boats, but the best scientific arrangements for launching fish-torpedoes against an enemy. In case of war, though her fleet is very insignificant, she would be able, by the use of fish-torpedoes, to virtually close the entrance to the Baltic. The Danes also possess islands in the neighborhood of the great German naval station Kiel, which are a standing menace to the German navy.

The log of the ship *Gladstone*, recently arrived at Sidney, Australia, records that on her last voyage a seaman fell overboard, and went into the deep green gulf without the faintest possible hope of coming on board again. As

he rose after the first header, right alongside he beheld an albatross, and around that albatross's neck he folded an arm, and with the other made a sure grip of the wicked hooked bill, and, with much flapping and floundering, he held on till the boat got down and lifted him in.

An Italian has invented a process for solidifying wine. From a small quantity of this extract may be obtained a bottle of generous wine of good taste and beautiful color. The object is to victual ships and supply armies. A chemist in Marseilles has found a chemical combination by which he can solidify and even crystallize brandy. The brandy in its new form looks like alum. It entirely loses its smell. The facility with which it can be transported is of course the main recommendation of the new invention.

Assaults upon life in the canton of Berne, Switzerland, have increased in number to a startling extent, but attempts to re-establish the death penalty are nevertheless resisted as tenaciously as ever. A proposal to this effect was rejected by the people in May, 1879, by a vote of 28,668 to 23,579; and now it has again been voted down in the Governing Council by 5 to 2. It is denied that the abolition of the death penalty has been the cause of the increase in crime, which is attributed to remissness in police service and prison management.

The rattlesnakes found on the Colorado plains are mottled and of a grayish tint—so nearly the color of the cactus and the grass which never takes on a vivid green, that a person might pass very near one and not see it, did it not sound its warning rattle. The reptile creeps into cellars, under boards, and a general watchfulness is always in order. The harvesters must keep a sharp lookout for this deadly enemy. When the stacks of hay are removed, it is not an uncommon thing to find snakes under them, or to hear the sharp, defiant rattle, as a bunch of grass is tossed on the load.

Some idea of the size of the match-trade may be gained by a glance at the figures paid for stamps. The Government exacts a revenue of one per cent. per 100 on matches manufactured. During the year ending May, 1881, one company paid for stamps \$4,500,000. This year the amount paid will be increased \$50,000. There are 200 matches in a box. The tax is two cents; they are sold to the grocer for three cents, and retailed at five. Four million five hundred thousand dollars represent 455,000,000 one-cent stamps. As each stamp represents 100 matches, the total manufactured is 45,500,000,000 matches, or 277,500,000 five-cent boxes.

A scientific writer in the *Mark Lane Express* says: "The flavor of beef is due to the juices; and if during cooking these be allowed to escape, the beef loses much of its taste. Hence, in broiling, it should from the outset be exposed to a bright, quick fire, which, by causing the superficial fibers to at once contract and the albuminous juice near the surface to coagulate, leads to the plugging up of the surface pores, and the consequent retention of the juices. Similarly, in boiling, beef should be plunged into almost boiling water. On the other hand, in making beef-tea, cold water is poured on chopped beef, and gradually heated to draw the nutriment of the beef into the water.

The St. Gothard Tunnel is now daily traversed by eight trains, four each way. Touching solidity of construction, the tunnel leaves nothing to be desired. The official inspectors express themselves perfectly satisfied with the condition of the work. Particular attention was paid to the windy stretch, which has caused so much trouble and given rise to so many fears; but the massive granite masonry with which this part of the passage is stayed seems admirably adapted to its purpose, and shows no sign of yielding to the immense pressure that weighs upon it. The ventilation is good, and no inconvenience was experienced from the temperature. The tunnel is lighted with lamps placed a kilometer apart.

The trade in cola-nuts is an attractive feature in the commerce of the Gambia. They are the seeds of a tree (*Cola acuminata*). From six to twelve are contained in woody pods, from three inches to six inches in length, of which five or less are produced by each flower. They are the product of Sierra Leone district, and the trade in them, both at Sierra Leone and the Gambia, is almost exclusively in the hands of women, to a large number of which it affords the means of livelihood, and in many instances the acquisition of considerable wealth. They enhance the flavor of whatever is eaten after them; but their most important property is that they have the power of staying, even for a prolonged period, the cravings of hunger, and enabling those who eat them to endure prolonged labor without fatigue.

Colorado has a subterranean lake of considerable extent, covered with soil about eighteen inches deep. On the soil is cultivated a field of corn, which produces thirty bushels to the acre. The ground is a black marl in nature, and in all probability was at one time an open body of water, on which accumulated vegetable matter, which has been increased from time to time, until now it has a crust sufficiently

strong and rich to produce fine corn. While harvesting, the hands catch great strings of fish by making a hole through the earth. A person rising on his heel and coming down suddenly can see the growing corn shake all around him. Any one having sufficient strength to drive a rail through the crust will find on releasing it, that it will disappear altogether.

For the last seven years works of an extensive character have been in progress at Milford Haven, Wales, connected with a design no less sanguine than the creation in Pembroke-shire of a second Liverpool. Large docks have been executed, a special railway laid down, and a pier constructed 700 feet long for the accommodation of ocean steamers, with a view to making Milford Haven "the port of the future for American trade." It is reckoned that a day at least will be saved in the length of the passage, while the Haven is supposed to possess unequaled advantages as a place of landing. The docks are approaching completion, and the pier and railway are ready for traffic.

The wonders of the West, including the natural soap-spring, the turtle-soup spring, and the Arkansas liquor-spring, on which the renowned explorer might have compromised who sought for the fount of perpetual youth, are now rivaled in oddity by a boot-blackening plant discovered in New South Wales. The leaves of this shrub contain a gummy substance, which, on being dropped over the leather, allows it to be polished to a dazzling glitter. Manufacturers of blacking, however, need not lose any sleep over this prospective rival for their trade. Having now been discovered, this boot-polish plant will probably relapse into the obscurity of those wonderful Western springs that run soup and whisky but are never seen by anybody but the original discoverer.

Herr Eduard Strauss, the well-known musical composer and bandmaster, has been trying the experiment in Vienna of transmitting the sound of his orchestra by means of the telephone, and writes on the subject to a Vienna journal in the following terms: "The experiment was brilliantly and surprisingly successful. Four microphones, of Ader's system, were employed. Eight telephones were placed at a considerable distance from the orchestra, in the same house,—which distance, however, was artificially lengthened, by means of cables, to four German miles. The tone of the whole orchestra was surprising; the wind-instruments, it is true, dominate; and even a stringed orchestra sounds like a military band. The flute and clarinet, however, keep their tone and character unchanged. The harp alone sounds

almost like a piano, and the side drum shriller than is possible in nature. The voice retains its full quality of tone." Herr Strauss intends to give the public an opportunity of taking part in these telephonic concerts.

DEFINITION OF ENERGY AND FORCE.

BY ELDER C. S. TOWNE.

WHEN we consider the results of death and of sleep in connection with a human being, it becomes evident that all human energy, action, force, and motion belong alone to the spirit and soul. Life must be present if we would see any manifestation of human energy and force. They are not left behind with the body, and it is certainly known that they are present with soul and spirit in our dreams.

Energy is correctly defined in a general sense as "internal or inherent power to act whether exerted or not." It is internal in relation to the body; but inherent in relation to soul and spirit. It may be separated from the body, but not from soul and spirit. The chief characteristic of energy is the ceaseless action of thought. It is also clearly shown that energy is a constant quantity in the universe which can not be annihilated. This fact gives rise to the Law of the Equivalence and Conservation of Energy. This expression has been substituted for another formerly used, viz., the Law of the Correlation of Forces. I hope to be able to show in a future article that there is a wide difference between the two, and that each has its own exclusive and legitimate sphere of application in the universe of Nature. If the thinking action of energy be extended to external objects, force is then manifested, and the objects move. Energy is constant; force is not constant. It may be augmented, diminished, neutralized, suddenly cease, or gradually disappear. Let me illustrate the difference. I am standing at the end of a hand-car on the railroad track; but though my hands are resting on the edge of the car, it does not move. Why not? Simply because the thinking energy has not decided by its will-power that it shall move. But when I decide that the car shall move the action of the energy flashes out, bracing the feet, pushing the hands, which in turn push the car and it moves along the track. Thus the acting energy becomes force, because the energy, acting in relation to an external object, forces it to move. When I push the car harder, force is augmented; when I push lightly, it is diminished. If another person pushes with equal energy at the other end of the car, force is neutralized and no motion produced. But the energy is

not neutralized. The following formula will always be found applicable everywhere: Energy acting upon matter produces Force resulting in Motion. Energy is the power to push; force is the actual pushing. In the case of man we find that force is never manifested except as the immediate result of the action of choice and will guided by a certain measure of intelligence. While we find that energy is everywhere diffused and always acting with variable degrees of intensity, we do find that force is not always so universally manifested, and that often it is wholly absent unless an independent human will decides that it shall be manifested and makes special arrangements for it. To illustrate. Here lies a heap of coal, or a cord of wood, and there stands a barrel of water. These things can not move themselves, and if let alone will never manifest any force. Yet it is absolutely certain that a vast amount of energy is stored in these things; still, there is no apparent action, no force, no motion. But if an intelligent human will place these things in the proper relations to each other, and to other inert bodies, as a system of machinery, or a train of cars, reverse action of the hitherto gravitating energy is excited, force is manifested, the piston pushed, and motion communicated to the machinery or the train. But this action, force, and motion could not possibly be effected without the intelligent interference of human will constantly guiding and controlling the whole manifestation. But the question arises "what is energy?" To say that it is inherent power to act, does not answer the question directly. The mind wants a specific definition. I answer then, that energy is composed of the electric and magnetic fluids. Magnetism is spiritual energy, or the power to guide action, force, and motion. Electricity is psychical energy, or the power to act, to manifest force, and to move inert matter. The nearest we come in Nature to seeing the separate action of spiritual energy is in the magnet. The nearest we come to seeing the separate action of psychical energy is in the electric flash. We see the combined action in all batteries; in all the work of Nature, crystal growth, vegetable and animal growth; then in all the operations of the human mind reaching upward and forward indefinitely and forever. The widest, grandest sweeps, the highest flights of the spirit's reasoning intelligence; the strongest, the most impassioned action of the soul's holiest and sweetest love, or the dark depths of its bitterest hatred, are all the action of these ever-present, all-pervading, ever-mingling fluids that we call electric and magnetic.

This brings me to the point where I must present to your attention the essential inherent

properties of soul and spirit as contrasted with properties of matter. We have first, magnetism the peculiar property of spirit; and electricity the peculiar property of soul. Then follow the various forms of the dual energy suited to the senses of the spiritual and psychical organism. First in the natural order of energetic action is light, or the seeing energy suited to the eyes of the inner man. The eyes of the body are only windows through which the eye looks out upon its environment. Light is the divinity, the eternal shining of energy. The creation of light is the highest concentration of electromagnetic energy in its widest separation from matter. Next in order is heat or the feeling energy of soul and spirit suited to the telegraphic network which as a dense film envelopes the whole exterior of the mental and emotional organism, intermeshing with the corresponding nervous tissues enveloping the body, and in a modified degree lining the interior or mucus membrane. The creation of heat is simply the liberation and free passage of energy from one body to another.

Next in order is sound, the speaking action of energy suited both to the organs of speech and of hearing. The creation of sound is the vibration of energy; its backward and forward motion alone subject to the decision of the will. To human souls and spirits limited by the mortal material of flesh and blood, the production of sound must always be accompanied by the vibration of material substance either in the organism of the body or outside of it. But the sound is not generated in the vocal chords, the tensioned string, or the metallic tongue. These are all simply regulating conductors of the electromagnetic-energy proceeding from soul and spirit. That sound is an inherent and peculiar property of soul and spirit, and not of matter, is made clearly evident in the human action of speaking and singing.

Remembering the great powers of speech and song, I ask is it possible to take the vocal chords in a dead body and with them reproduce the varied sounds of speech and song? Is it any more possible or reasonable than that Corti's rods in the ear should vibrate in unison with the lowest, or any strings of the piano? But you may say "the sounds from strings or metallic-tongues will not only imitate the highest and strongest powers of song, but far surpass them; does not, then, the substantiality of these sounds lie in the material substance of the string, or the tongue?" I answer, no; because the same energy of soul and spirit is within and behind them, and a human will and intelligence have contrived the mechanism that is thus sending out in streams

of melody or harmony the sounding energy of soul and spirit.

Take the case of an organ. Its metallic tongues must be the metal they are because there is in the metal a concentration of the superhuman energy everywhere present in Nature, equal in power to the energy exerted by the human soul and spirit in the action of singing, or, it may be, superior to it. But even this state of concentration must first be brought about by the complicated action of human intelligence, as it is not present in the rough ore. Human intelligence must then contrive the mechanism which shall cause acting energy to manifest force only where the tongue is placed. But is the perfected organ inherently able to utter a single sound, much less the floods of harmony that thrill the soul through all its being? No, indeed. The choice of a human will must decide within itself what sounds shall be uttered, as it does in its own singing; and then its energy must act in immediate relation to the mechanism of the organ.

Instantly the player's energy flashes silently through the feet, the pedals, the bellows, and the air within till it reaches the tongue. Then because the tongue has within it so strong a concentration of energy which cannot escape, it becomes a rapid conductor of the electromagnetic energy of the player, and the sounds conceived in the player's mind are flashed out upon the air, and the ears of the charmed listeners; and it is *sound*, because human will has decided that it shall be, and has given the tongue vibratory power corresponding to the vibrating power of the soul. The streams of sound are then transmitted by simple conduction like the currents of a battery over the wire; but as the air is everywhere diffused the currents of sound radiate in every direction, caught right and left by the conducting power of the air, till the subdivisions are too minute to affect the ear. When sound is caught in the receiver of a telephone, it is all conducted over the wire without loss and in silence; but is manifested as sound again the instant it leaves the wire and strikes the organ of hearing. This fact, of sound passing in silence over a wire, gives a conclusive answer in the negative to the question so often asked: "If a large tree fall in the midst of a plain where no ear is within many miles, will there be any sound?" There will be a strong vibration of sounding energy, but it will spread in silence till absorbed by the aerial ocean, and no sound will be recognized, because there is no organ present fitted to receive the sound. For the same reason there can be no seeing in the presence of

light if we have no eyes; no taste and no smell without the peculiar organs fitted to recognize them; these last-named senses being also peculiar forms of energetic action suited to their respective organs.

The last property is gravity, which is the highest concentration of energy in its most intimate connection with matter. Here we find the explanation of the fact that at certain times in our dreams we feel free from the influence of gravitation, gliding on without touching the ground. We are then freest from the body; our independent personal energy is nearest its separation from matter. Gravitation stands at the opposite extreme of light, producing darkness. As light is the eternal shining omniscience of energy, so gravitation is the eternal on-rushing omnipotence of energy flashing out to the bounds of Nature, then swinging back in unbroken circles to bind it all to the Will of the infinite One.

The only properties of matter that we can speak of with reasonable certainty are inertia, non-annihilability, impenetrability, extension, and figure; and it may even be questioned whether the action of gravitation does not itself give matter the last three named properties. All other properties, whether called universal or accessory, are simply phenomena, resulting from the union of mind with matter, and express in ever-varying degrees the intensity and manner of the union. It does not logically follow that, because we see these phenomena manifested in connection with matter, therefore they are its inherent properties. We might as well say that mind and thought are inherent properties of matter. We have never seen the thinking powers of mind manifested except in intimate, living connection with matter, but we know that all the action of thought, and all the living actions of sight, sound, heat, taste, and smell are instantly separable from the matter; though we have never seen mind pass free from body to body or out into open space. But we do see electricity pass free from body to body. We do see electromagnetism pass free between the carbon points of the battery; and from every kindled fire the superhuman electromagnetic energy acting in Nature passes free into open space. We know that whenever the electromagnetic fluid is loosened from its concentrative action upon matter at one point, it moves with great and varying velocities to some other point. And we know that when matter is separated as much as possible from the action of energy, it cannot move. When the thinking, planning, active mind is separated from the body, inertia lies passively triumphant till the free energies of Nature, never resting, seize the inert atoms

and drag them apart to the lowest level of dead dust. From those universal facts we can not think that these ever-varying actions, motions, and velocities spring from inert matter. It becomes entirely reasonable to predicate them all of the mind whose independent energies grasp in their intelligent actions a miniature Microcosm, second only to the Microcosm whose mighty displays of energy are but the infinite correlations of the human. This thinking mind and its electromagnetic energy in correlation with the Divine, triumphantly claim as their eternal prerogative all action, force, and motion; while matter, with no power to claim, lies only as the obedient, unresisting servant, now grasped in the adamant chains of gravitation and darkness; now relinquished that energy may throw the glories of its light to stars and suns and planets; now strung out in telegraphic lines that myriad voices may speak their music to listening ears; but everywhere and always the passive instrument of the unseen mind, the center of the unseen universe, whose certainties are so flashed with light and power and music and warmth through all the material forms of the seen and temporal, that he who denies the unseen and eternal ONE, is left alone in the silent darkness, the chill inertness of eternal death.

THE BIBLE AND SCIENCE.

BY. PROF. I. L. KEPHART, A. M.

SOME of the most noted assailants of the Bible's claim to inspiration have been remarkably ignorant of the contents of the Book of books. Strange as this statement may appear, it is indisputably true, and with thinkers, is wondrously damaging to their assaults. Dr. Johnson says that David Hume admitted to a clergyman in the bishopric of Durham that he had never read with care, even the New Testament.

Thomas Paine was once questioned as to his knowledge of the Bible. His reply was: "I keep no Bible." Carlyle declares that Voltaire's testimony against Christianity is worthless, because of his ignorance of the subject against which he testifies,—that he ardently and with long-continued effort warred against Christianity and the Bible, without understanding, beyond the mere superficies, what Christianity is, or what the Bible teaches.

Halley, the astronomer, once avowed his skepticism in the presence of Sir Isaac Newton. The venerable scientist replied: "Sir, you have not studied these subjects and *I have*. Do not disgrace yourself as a philosopher by presuming to judge on questions you have never examined."

This is wholesome advice to modern scientists the observance of which would sweep from the minds of many their groundless disbelief of the Scriptures. If the thinkers, who have doubts respecting the authenticity of this Book, would lay aside their prejudices and give it a careful examination, doubtless they would be driven to say with Coleridge: "I know the Bible is inspired, for it finds me at greater depths of my being than any other book."

The Bible claims to be a revelation to man from the God of Nature. It claims that the God of the Bible—the Creator whom it reveals—is the God of Nature,—“God over all and blessed forevermore.” If this be so, then creation, *rightly understood*, communicates the Jehovah of the Old and New Testaments. This is what Paul asserts in Romans 1:20. He there says: “For the invisible things of him from the creation of the world are clearly seen, being understood *by the things that are made*, even his eternal power and God-head.” That is, Nature reveals to thinking minds the fact of God's existence and the general character of His attributes, just as the master-painting asserts the existence of the artist and indicates the thought of his mind at the time he was executing his design; and that by carefully and intelligently studying Nature the master-production of the Master-Artist, God—man may correctly discern the being, the thought, and the purpose of the One who produced Nature, just as the artists of to-day, by closely examining the sublime productions of Raphael's brush, may understand the thought and purpose of the great Italian at the time he applied the colors to the canvas. And as it is impossible for the modern student who contemplates the Sistine Madonna to doubt that Raphael existed and wielded a master's brush, so is it impossible for him who critically studies the great picture of Nature every where spread out, to doubt the existence of the Omniscient Artist who painted it.

Infidels, atheists and materialistic Scientists have ever been only too ready to seize upon any new discovery in natural science to show that Nature and Revelation do not agree. The declaration that the teachings of the Bible and the truths of science are irreconcilable has always been a sweet morsel under the tongues of unbelievers. But, thanks to candid investigation, just in proportion as the *facts* of science are determined, and the phenomena of Nature correctly understood, the truth is demonstrated that no such conflict has ever existed. (Right here I wish to say, that to me it seems that God has especially raised up the Microcosm and more especially its editor, for the purpose of

compelling scientists, so called, to be more thoroughly scientific and less speculative and visionary in ascertaining what the *facts* of science are; and that the manner in which he has demolished the wave-theory of Sound, spontaneous generation and evolution has proven a gigantic stride in the direction of accomplishing what, under God, seems to be his special mission in the interest of scientific and religious truth).

The correctly-ascertained facts of science, and the intelligently-interpreted operations of Nature are each day bringing thinkers and observers up to the irresistible conclusion that "whatever is fundamentally scientific is also profoundly Biblical, and whatever is fundamentally Biblical is at the same time profoundly scientific." The truly candid scientific mind realizes the importance of discriminating between the *facts of material science*, and the speculative sophistries of a materialistic philosophy. The *true* scientist investigates Nature, intent on determining as far as possible, what the facts of natural science are; and having ascertained them, he proclaims them to the world, leaving the theories and the consequences to take care of themselves. Thus far, none of the *facts* ascertained conflict with the fundamental teachings of the Bible. Let unbelievers make a note of this.

The materialistic philosopher does not confine himself to the *certainities* of science, but steps over into the field of speculation. From a few *facts* of science that are in harmony with the Bible, he jumps to theories which conflict with Revelation; and on such a flimsy premise he runs his argument for laying aside as unreliable and unscientific, the Book of books. He investigates, not to ascertain what the truths of science and of Nature are, but intent on discovery of that by which to establish his theory. It is one thing to arrive at a conclusion through the agency of scientific *facts*, but quite another thing to bolster up a pet theory by a series of metaphysical speculations.

The true scientist who draws his deductions from the unmistakable data of thoroughly tested scientific *facts* cannot err; for every scientific *fact* is a truth of God; but the materialist who simply *infers* from a series of speculations, is quite as liable to err in his conclusions as is he who by looking at a load of hay, for example, guesses that its weight is exactly so many pounds avordupois. Louis Agassiz was a true scientist. He drew his conclusions from well-authenticated truths of Nature, and hence, was not an atheist nor an evolutionist. Monboddo, Haeckel, Huxley, Vogt, Buchner and company, are speculative, materialistic scientists; and although they are men of

vast research, yet, in their anxiety to establish a previously espoused hypothesis, they have suffered themselves to be led astray into the unexplored labyrinths of metaphysical speculations and have jumped to conclusions that are not substantiated by facts; hence, they are atheists in religion. The orthodox evolutionists also, have fallen into the same error, whether they be agnostic or theistic. Agassiz said of Darwin: "He jumps to conclusions that are not justified by the *facts* of science." Is it strange that such speculators conclude that "the Bible and science do not agree," and hence, reject its claims to inspiration?

THE LOST LINK.

BY REV. WM. ALLEN.

IN contrasting the origin of species, according to the scientists, with the Mosaic account, we find the former are at a loss in connecting man with the creatures below him, whereas the latter solves the problem, by showing up a creature above the ape species and still not the equal of man. For this creature was classed with the beasts of the field, but was more intellectual than any of them. He was not the equal of man, for to man was given dominion over all the beasts, and consequently over this animal called "the serpent." Now, to show this animal to be the connecting link between man and the chimpanzee, or highest order of monkey, we think can be made sufficiently plain to convince the scientists, unless they are stubbornly inclined and far more credulous in another way.

This "beast of the field," or "lost link," must originally have gone upright, or else how can we understand that to go prone or on its belly to be a curse? Yet this is one specification in the curse pronounced upon it. It must have had intellect and language above all other beasts, for how otherwise can we account for the conversation it had with Eve. He must in some sense have been a moral agent; if not, why was his conduct regarded as such a crime, and such a penalty as going prone and eating dirt visited upon him? The visitation of the penalty shows that he was under law, although there is no express statement to that effect.

This, we think, shows up the "lost link," both Mosaicallly and scientifically. But scientists need never expect to catch one such alive; for such a curse was put on it to go prone and eat dirt, that from its origin it did not belong to the "fittest" to survive. No doubt its struggle for life was well contested, and if written would be an interesting narrative. Yet none but a visionary scientist can delve among the

rocks and sandbeds of earth and put together such a record. The man of science who is determined to find the "lost link," must first locate the spot where Eve and the serpent held their conversation, right under the shade of the "tree of knowledge," and round about there, not far off, he may indulge the most hope, in sinking his shafts, of finding the long desired "lost link." The law of "survival of the fittest" would not let it live to participate in another such drama as that acted eastward in Eden!

We infer from this that the Mosaic account of the creation is more than equal to all that spontaneity in early forms and improvement by gradual steps can show, as held by scientists so-called. And "God said let the waters bring forth *abundantly*," Gen. i: 20-21—that is, keep the chain perfect in its links. "And God made everything that creepeth on the earth after his kind," Gen. i: 25. He made all forms of animals, so that the mind of man is not capable of conceiving of all things, unless they have been already made. All the links have once existed, though some of them may not survive to-day.

CONSISTENCY OF INFIDELITY.

BY REV. S. C. LITTLEPAGE, D. D.

"O consistency thou art a jewel."

How resplendently it shines in the wisdom of the scientific world! All along the ages it glistens in sentiment and resounds in song, making melody to the everlasting music of the spheres.

The key note of its harmony, the central sun of all its scintillations, is the statement found in an old volume they all agree to denounce—"There is no God."

How consistent and philosophic the theory of the old cosmogonists—"The world rests on the back of an elephant, the elephant on the back of a tortoise, and the tortoise on the back of nothing." Who would take issue with the wisdom of such a proposition? It was in beautiful keeping with the more modern developments of skeptical science: for instance, that large class of scientific philosophers, headed by Kant and Gliden, who boldly held that it was impossible for all men to have been made of "one blood to dwell on the face of the earth," showing conclusively, and *by the light of science*, that the difference in type, texture, physiological structure, nature of the hair, &c., was all too great to admit of such common origin and absurd unity, even under the operation of an Almighty cause. And oh how gladly the sweet birdlings of science with open, hungry mouths took down the precious mor-

cean and cried—Sure enough, from their unwasted fullness comes a bountiful supply of savory and consistent philosophy. From the lips of the great Charles Darwin they receive the welcome theory, that the infinite breathed into a single cell, or at most into a few such cells, and from these primordial cells, all the nations of men, with all the diversity of type, and texture, ah, and all animals, birds, and creeping things have origin by their own inherent force without any further aid from the antiquated "Ancient of days," to whom some simple folks look as the author of all things! Again, who can fail to see the beautiful consistency of Professor Huxley, who, in carrying out the scientific theory of the old cosmogonists, Kant, Haeckel, and the rest, with whom wisdom is doomed to die, sees all things great and small take their rise in spontaneous generation without a generator or any help from Heaven or any other source! And in harmony with this we see the beauty of Herbert Spencer's discovery, that in "force we have the potency and prophecy of all life;" and then the unity and harmony of the beautiful science (it would be degrading to call it "divine philosophy," since its chief charm consists in the facility with which they eliminate all divinity from it) is only equalled by its clearness and simplicity of statement. How can the way-faring man, though a fool err therein? Take Spencer's definition of life as an example; "the definite combination of heterogeneous changes, both simultaneous and successive, in correspondence with external co-existences and sequences." Who can be sufficiently grateful for such a clear and satisfactory definition of this parent of all phenomena? Take another definition equally clear and elaborate of as simple a thing as a hole, and all old foggy folks who believe with Copernicus and Newton that "God created the Heavens and the earth," had better be hunting it before they are compelled to crawl in and pull it in after them. But let one capable of the sublime conception give the definition. "A hole can only continue to be a hole so long as that in which it is a hole continues, yet the content quantity of the hole is not affected by that which limits it and gives it form in the understanding." The equal care with which these definitions are given reminds one of Pope's conception of the author of universal Nature:

"Who sees with equal eye, as Lord of all,
A hero perish or a sparrow fall."

But alas! what genius can describe the elevating tendency of such pure scientific truth on the masses of mankind? "Like priests, like people," may still in the main be true, though originally applied in times when man

"looked through Nature up to Nature's God." When our grandmothers and other simple people loved to find an expression of the great Father's heart in the bloom and beauty in the universe: looking upon sunshine and shower, seed time and harvest, youth, manhood, and mellow old age, life and death, faith, hope, and Heaven as modes of blessing, and sought to make some poor return for such infinite love and care by the heart's best affections and life's devoted duties, in building temples for His worship, and asylums for His poor, schools for His children, and homes for His aged, when holy men "pointed to Heaven and led the way." But ah! what sweetness then comes with science! Its primordial fog obscures the sun of the glad old days. The cell or moneron usurps the throne of Him whose handiworks were the ever shining singing stars, the rejoicing earth with her happy children. Now look at the grand old Darwin. He has swept the mighty round of scientific lore, beginning with the cell, he is ending with the worm. He has ascertained that worms have affection, social qualities; they crawl over each other, and endure the light for the sake of their lovers. Is it true

"'Tis home where e'er the heart is,

Where e'er its living treasures dwell?"

And is Darwin's heart with the worms? Are these his treasures? Is it true that nothing is great or small but to a mortal's thinking? 'Tis but the littleness of man that seeth no greatness in a trifle. But in sober truth, where must all this foolishness end? Are the vast fields of thought and being forever to be smirched with "the trail of the serpent?" No! no!

"In spite of pride in boasted reason's spite,
This truth is clear whatever is is right?"

It is right that man's volitions should be free, that the hooting "owlet atheism" should lose its moral sight in darkness, when it will not see the sun.

It is right that God should chain these masters of scientific search to the car of progress, and drive them through the illimitable universe, developing and illustrating His infinite wisdom and power, and though drunken or maddened with what they find or fail to discover, yet in the end bewildered, sobered thought, on weary, helpless wing, will return to God and find its life in the study of divine perfection, and the assimilation of moral character of the divine ideal. "It is written God taketh the wise in their own craftiness." The wisdom of "the world is foolishness with God," so that in the end this mad and godless scientific search will give an abundant illus-

tration of the Scriptures—"The fool hath said in his heart there is no God." This is a severe statement, but the Bible is very plain, when men are very polite; certainly the meaning is not that such men are fools in everything, but in this great fallacy of denying the Divine existence, however great or wise in all things else. "God maketh the wrath of man to praise Him, and the remainder of wrath will He restrain. Then perhaps will be fulfilled the declaration, "the Lord shall have them in derision." Then will His enemies learn what they might have read before, "I form the light and create darkness, I make peace and create evil, I, the Lord do all these things."

Though not a prophet or the son of a prophet, I venture the prediction based upon the mental and moral activity of the times, the character and scope of research, the nature and number of investigations, the persistency with which every department of investigation is pressed, the boldness with which the sons and slaves of God pursue their tasks, the rapidity with which culminations are reached, as well as the more sure word of prophecy, that in less than half a century "The earth will be filled with a knowledge of God as the waters cover the sea," when the undevout scientist will be rated mad by common consent, when half truths will be brought together like the tessero hospitalis, and as the tangled straws of truth shall be wrought together in a cord of infinite strength and beauty, it will bind all who love it to their Divine author—"God over all blessed forever."

ORIGINAL INTUITIONS.

BY PROF. J. SALYARDS, A. M.

In my last paper, I ventured to reprove the evident tendency which science and scientific research display at the present day,—a tendency which must result, at no very distant period, in greatly impairing the belief of man in the existence of an intelligent Creator. I was emboldened to make these suggestions by the hope that some of the able contributors to *The Microcosm* might be led to consider the subject,—and point out the perils of this tendency in new and perhaps more striking channels. And yet, no friend of human progress could for a moment desire to retard the advancement of mankind even on this line. The common desire must be, not that the facilities of human industry, the inventions and discoveries towards enhancing the powers of man, should become less numerous and wonderful, but that in enlarging the capacity of mind in one direction, man should not forget to cultivate other capacities, and other interests really

more exalted, and more congenial to the happiness of a rational being.

Every investigation, every discovery made on the operations and uniformities of Nature, on her various forces and powers, and their several applications to facilitate the labors of man, enlarges and enlightens the human understanding; but there is danger that it will enlighten the understanding only. The pious humility of a Sir Isaac Newton could explain the motions of the heavenly bodies on his principle of gravitation provided he could find the origin of a projectile force in each case. This origin he readily found in the voluntary power of an Almighty Architect. More recent philosophers, however, now find that origin of projection in revolving nebulae or the explosion of flaming masses. The understanding is satisfied, and we see no necessity for a living Intelligence. From the simple fall of an apple a Newton could infer the law of universal gravitation. But how did he infer this? Certainly not by the power of the understanding, not by the generalization of individual facts in experience,—that egregiously erroneous method by which some modern scientists account for the existence of necessary and universal truths in human consciousness, but by the power of *reason*, our great comprehending power more exalted and divine than our discursive power of understanding.

Reason is our great synthetic power. It unites in a single glance the finite and the infinite, the imperfect and the perfect, the contingent and necessary, and beholds the relation between them. Its own elements being three in number, it views all Nature in her duality, and comprehends them by their relation. The understanding may analyze its objects, may abstract, may generalize and classify, but its generalizations are arbitrary and often erroneous. All the prophets, the poets, the historians in our Holy Bible, continually appeal to these ultimate facts, these necessary truths of reason. It is reason, and reason alone, which discriminates between our sacred books, and the Indian, the Mahomedan, or the Pagan. We properly call the reflections of the understanding, notions and theories; the revelations of the reason we call ideas, intuitions. Let Reason accompany the astronomer, and she will soon whisper, "The undevout astronomer is mad." Let her accompany the geologist and when he has investigated all the fossil remains in the earth's crust she makes him know that mineral, and vegetable, and animal, all had a beginning. If she wander with you by the Mississippi and the Nile, you are made to know these rivers have each a fount, a source, though all the researches of the understanding

may never find it. Thus she has guarded the entire horizon of intellectual knowledge with ultimate facts, like so many golden palisades reposing upon jewels of necessary and universal truths. Here is the fact of order, here of law, here of cause and effect, here of life, here of immortality. She leads you from the individual and finite, into the awful presence of the Great Necessary Being—full of truth and love, wisdom and benevolence. Now understand why the human reason cries out for the living God.

With her at my side, I have no difficulty in comprehending the truths so ably advanced and maintained in the "*Problem of Human Life*." A ray of light issues from a distant luminary. It is conveyed to me by some medium—the luminiferous ether of the understanding will have it so. It affects my optic nerve, from thence the brain, and then, somehow, beyond the power of understanding to trace, it becomes a part of my consciousness, and I behold the glory of light. I call it light—I know it is light,—a positive, glorious, shining, essential reality. I hear a distant strain of music. The strain has reached me—understanding may explain how. The strain is sounding in the chamber of my consciousness, and reason comprehends it to be sweet, melodious sound, a real sound, and if I utter the words with my lips the music is reproduced.

Just here lurks the danger of too exclusive devotion to the empirical sciences. The human mind runs up and down the great chain of causation—the *causa causans* and *causa causata*—without stopping to consult that highest prerogative of man, which loves to contemplate the ineffable grandeur and perfection of the Cause uncaused, seeing in Nature quite a number of forces and powers, perhaps inventing a little *protoplasm*, and lo! the wide realms of physical existence swarm with phenomena of vitality and intelligence, without the intervention of a living God! Sometimes it is pride of intellect that leads men to claim this sublime discovery; more frequently, perhaps, the guilty desire to get rid of a personal, living God, who loves truth and justice and hates iniquity. But if we get rid of Him, who has invited us to pray "Our Father," what may we get? If the powers of spontaneous generation could bring forth in these green vales of Earth such a monster as Giteau, what demons may have been generated long ago in the wild realms of Nature, to which we are hastening? For if we consult for a moment our boasted infallible science, we discover that young or old, sick or well, awake or asleep, we proud organisms are here and cannot help it, we are whirled to the East 700 miles an hour, around

the sun 65 thousand miles that same hour away from the point of space we now occupy and which we shall never pass again, in much less than an immortality, around the centre of our nebulae, soon to be among the demons of spontaneous generation. O, pleasing refuge! there is a Father, whom we can call Our Father!

MATERIAL—SUBSTANCE.

BY JULIUS ASHMAN.

I HAVE read with great interest the different numbers of *The Microcosm*. It seems to me that one of the principal causes of the confusion and darkness that reigns in scientific matters, results from the lack of a clear understanding of the meaning of words conveying primary ideas. Your controversy with Dr. Hazard results to a great extent from that. He calls all substance matter, but to your mind as to mine also, matter conveys only the idea of a certain kind of substance, or in other words material substance. This material substance or matter is the substance which constitutes the earth, and its inherent quality is to gravitate to the center of the earth. But there are other substances active on the earth, but which are not from the earth, but are derived from the sun; they are not material substances, but ethereal substances, or if I might be allowed to coin a word expressing their quality I would call them paterial substances, because they are the generative, form-giving substances, which are generally called forces. They may be active or restive, that is kinetic or latent. In their active state they manifest themselves in a form of motion, but a motion must presuppose a substance that moves: to separate motion from a substance that moves, may be done as an abstract, intellectual *jeu d'esprit*, but in reality it cannot be done and would be in fact absurd. A spoken word is a substantial entity or complex of entities: when it moves from my mouth to the ear of a listener, a substantial complex of force-atoms must move through the air; they will produce a commotion of successive lines of air-waves in passing through it, as the keel of a ship will do in the water, but the air-wave is not the sound, but a secondary result. I cannot see how it is possible to have any clear conception of all the different every-day occurrences that surround us, if we do not consider forces to be positive, ethereal substances. For instance in cooking. To eat cooked food, is probably at the root of a great part of the higher development of the human race; in

cooking, we charge the products of Nature with a higher dynamical quality, by impregnating them with heat, that is the original, ethereal, solar substance, the source of all life and all sensibility; also all mental growth is only the result of greater sensibility. Not to consider heat a substance, would take the ground from below our feet; we have nothing to think or to reason with.

By producing steam-force, we simply charge water with heat-force, which, when the water is in a close vessel, necessarily produces a state of tension which finally explodes as active force. What in the world could cause an explosion if there was not a substance enclosed that forced its way out? When the heat-force can find a way out through the iron pores of the kettle, the tension subsides, the water cools off, the steam-force is gone.

All organization of physical life on earth is the result of the embodiment or incarnation of a solar, ethereal, *paterial* substance into a telluric, *material* substance; each substance has its own inherent form of action, the one centrifugal, radiant, expanding, the other centripetal, contracting, and from their reciprocal interaction ensues all life. But the word substance itself indicates that there is yet something higher above that, not a substance, but a *stance*, or being, or essence, that is God, which is spirit or the form-giving substance of the ethereal substance, the soul of the soul, and that proves self-evidently the continuance or immortality of a soul after it has left the body, because it has become itself the body of a higher soul or spiritual principle, by which it is formed.

In one thing I cannot agree with the author of the *Problem of Human Life*, who makes gravity a force-substance separate from matter. I consider gravity as the inherent quality of material substance. All substance has gravity as its inherent quality; it is that quality which makes any substance to be attracted by or to gravitate toward the center of that body to which it belongs. Thus the radiating force of ethereal substance on the earth is in fact only its gravitation toward the center of the sun, and the aspiration of the spiritual soul of man toward God is its gravitation toward the center of the divine body to which it belongs.

The phenomena of life, both physical and spiritual, appear to me to assume such a transparent lucidity and simplicity, if we can only shake off the fetters of a godless, false science and dare to think for ourselves. That the editor of *The Microcosm* will valiantly strive on and prosper, is my sincere wish.

EXPERIMENTS AND EXPERIMENTERS IN SOUND.

BY CAPT. R. KELSO CARTER.

IN the March number of *The Microcosm* I undertook to demolish the celebrated experiment of Tyndall and Mayer, whereby the length of a tube resounding to a fork was supposed by them to be exactly one-quarter the length of a sound-wave generated by the said fork. I alluded to Wilford's experiment's showing that a C fork called for a tube of a depth of 11½ inches, instead of the 13 inches called for by Tyndall. I stated that my own experiments had corroborated Wilford's so far as a cylinder standing on a table and tuned by water poured in at the top, is concerned; I showed that the resonant wooden box made at the very factory attached to Professor Mayer's own college in Hoboken, New Jersey, was not the depth stated by him as necessary for the A fork, and lastly I spoke of a new apparatus devised especially for the occasion to show up the general action of resonant tubes. The need of a more perfect apparatus was made evident to me in this way. I prepared a tube exactly in accordance with Professor Mayer's instructions, with a sliding cork, and as stated in the previous paper found the A fork resounded loudest for a depth of 7.4 inches, instead of the 7.66 called for by him. But my experiment with this tube did not stop here by any means. Professor Tyndall says: "This rule is general," and it very naturally occurred to me to test other forks and see if any one of them would give a result that would approximate any nearer to the requirements of the wave-theory. I had, besides the A fork of Professor Mayer's description, a small C fork of 528 vibrations, from the same factory, and a large C fork of 256 vibrations of the Koenig standard, made by Queen, of Philadelphia. Both of these were tested thoroughly and repeatedly, in obedience to Professor Mayer's injunction at page 120, when describing his siren experiments,—“Repeat these trials many times till the numbers are found which will not differ much from one another.” The results will cause some astonishment to the advocates of the wave-theory.

With the large C fork I found to my own surprise that the length of tube, required for its greatest resonance was 13.6 inches. Constant and persistent efforts for nearly half an hour showed that Professor Mayer's tube with sliding cork would give no other length for this fork than 13.6 inches. (I measured with my fine scale, 50 graduations to the inch.) Here was something very curious to say the least. When a glass tube or cylinder was used standing on a table and tuned with water, I had

obtained substantially the same depth as that recorded in Wilford's test, viz: 11½ inches, and had found this depth the same with *several vessels of different diameters*. But now when the tube with sliding piston was used, behold a seriously different measurement resulted. But Professor Mayer used this tube-length to calculate the velocity of sound in air, and thus demonstrate the correctness of the wave-theory. Let us see what velocity will result from this new length of 13.6 inches. Multiplying by 4 we have 4.53 feet for a whole wave-length, and multiplying this by 256 vibrations we are confronted by the number 1159.68 feet for the velocity of sound per second. Manifestly something was wrong. Tyndall's calculation with the tube had resulted in obtaining (by a gross blunder) the needed length of just 13 inches, which, being multiplied by the numbers given above, produced exactly the proper velocity for sound, or 1120 feet per second. Mayer's attempt with the A fork of 440 vibrations also resulted in a perfect fit, though how it was done I cannot divine, unless the injunction above quoted furnishes a hint as to the method. But my experiments with both forks, using Mayer's tube, resulted disastrously all round for the wave-theory. I next took up the small C fork of 528 vibrations, and soon determined that the tube-length for it was just 6.34 inches. Multiplying as before, this new experiment gave, for the velocity of sound, the still more uncomfortable figure of 1071.84 feet. If the temperature had been below freezing this would have been near enough to the theory to admit of doubt, but the fact that all my experiments were performed in a room where the mercury marked about 70° F., completely upset any such suggestion. I had now before me three results obtained from three forks, and three different velocities, viz, 1159.68, 1071.84, and 1089 from the A fork, as stated in the March number of *The Microcosm*. Suffice it to say that I became disgusted, especially when I looked at the difference obtained by using the glass cylinder on a table and the tube with sliding cork—a difference of about 1½ inches for the same fork. At this juncture Captain B. F. Morely suggested an improved tube. We took a glass 2 inches in diameter and about 4 feet long. In one end was fitted a perforated cork tightly sealed with wax, through which passed a short glass tube. The large tube was clamped in a vertical position against a table, a long rubber tube fitted to the small glass passing through the cork at the bottom, and a large glass bottle with a tubulure at the bottom attached to the other end of the rubber tube. This bottle was used as a reservoir to supply water smoothly and silently to the long tube

and was swung by a simple cord and pulley so that it could be raised, lowered and stopped at any point. It will thus be seen that I secured a splendid resonant tube with a piston that could not allow any air to pass, and that slid with perfect smoothness, always presenting a surface at right angles to the walls and free from any jar or inequality of motion. By raising the reservoir the column of water in the tube could be made to rise rapidly and silently, and thus the precise point at which the note of the vibrating fork held over the tube's mouth was most augmented, could be determined with mathematical precision. I used the same forks heretofore described and found that repeated trials required no averaging, because the results were always exactly the same to the fiftieth of an inch. The lengths obtained were as follows:

	Length.	Velocity.
C 3 of 256 vs.	12.5 in. x 4 x 256 = 1066.2 3 ft.	
A of 440 vs.	6.9 in. x 4 x 440 = 1003.6 ft.	
C 4 of 528 vs.	5.7 in. x 4 x 528 = 1003.2 ft.	

Here then we find still a different set of numbers. Now what is to be done with them? I believe the apparatus employed to be about as near perfection as possible, and there can be no question that these tube-lengths are certainly and exactly true. Yet we see that they are all entirely too short even to approximate to the requirements of the wave-theory. Yet Professor Tyndall says: "This rule is general, and might be illustrated by any other of the forks instead of this one," (a C 3 precisely like mine), and Professor Mayer seemed to have proved it by using an A fork. Just here I pertinaciously contend that the wave-theory must stand or fall by this one experiment. There are many others in acoustics which involve principles more or less complicated, and by which it would perhaps be unfair to judge of the whole foundation of the structure; but this one is entirely destitute of such saving excuse. It is a simple affair from first to last, devoid of any complications, and always supposed to be a beautiful illustration of the wave-theory, because so simple that any boy half through arithmetic could readily comprehend its force. Yet nothing can be more apparent than the conviction that the wave-theory hopelessly breaks down, not only from failure to explain the results, but by direct refutation of the sternest kind by those very results themselves. The remarkable agreement between the velocities obtained from the A and C 4 forks did not strike my attention until this moment. I do not pretend to account for it, although the fact that both forks were made at Professor Mayer's factory may in some measure explain it. I mean no unkind reflection

here, but the immense singularity of this whole experiment as performed by Tyndall and Mayer, must be apparent to every one. Why did Professor Tyndall *happen* to use a glass jar with a bell-shaped mouth! Why did Professor Mayer *happen* to use a legitimate straight-edged tube? Had he seen the caustic criticism of his great exemplar in the "*Problem of Human Life*?" If so, he must have chuckled in his sleeve over the discomfiture that would come to Wilford when he read that an A fork gave the necessary results with a straight tube; the difference between 7.66 and 7.4 being in his eyes apparently insignificant. But again, why did not Professor Mayer happen to try Tyndall's C fork with his tube and cork? If he had done so the extra 6-10 added to Tyndall's 13 inches would surely have raised sufficient curiosity in his mind as to lead to a few honest experiments with other forks and tubes.

[Concluded next month, and look out for breakers.—ED.]

THE HUMAN SOUL.

BY REV. B. F. WHITE.

Is the soul a principle? We answer no! Principles "per se" are as old as God; they are uncreated. Souls are only immortal, not eternal. Oncesouls were not, principles always were. All principles are found in the being and attributes of God. Is the soul the principle of animal life. Animal life is a result; a result first of creation and secondly, of chemical and mechanical action. This creative energy acted according to law and law is founded on principles. Is the soul the animal life itself? Again we answer no! Souls are immortal, animal life is mortal. Animal life is dependent on food, air, water, exercise, for its preservation, and still it will cease by the wear and tear of the physical organism that it vitalizes. The steam of the locomotive will represent animal life; the fire combustibles and water its food; itself the result of their action. The engineer the soul and the locomotive the body. The soul controls the body, directs its food and action, the body wears and the soul ceases to use it, when it is untenable. Is the soul the mind? Again we answer no! The mind is merely a power of the soul. The soul is the living entity and the mind one of its powers; just as the power to grasp is inherent in a perfect hand and not a part of the hand. My hand is composed of flesh and blood and bone and muscle. It has the power to grasp. My soul is an immortal, spiritual entity, and has power to think, &c. If mind

and soul are one and the same *per se*, then a mind-faith is a soul-faith, and a soul-faith is no more than a mind-faith; and a mind-faith, or the necessitated acceptance of a demonstrated problem, as two and two make four, is all the faith that is possible to the human soul. If so, faith is a necessitated state of the soul, and man's moral responsibility ceases; moral character is a myth, and moral good and evil are nonentities. In fact the intuitions of mind, are only to know, or not to know. Mental faith is a misnomer. Mentally I either know a thing or I am ignorant of it. If I attempt to say I hope I know it, think I know it, or believe I know it, it is evident I don't know it and am ignorant of it. The soul is more than mind. It is a sublimated substance, immortal in its nature; and among others, it possesses the powers of ratiocination. Now I will wheel into line with psychologists, and run in the old ruts. The soul is an immortal entity, possessed of three classes of powers, (*viz*) mental, sentient and volative. My soul reasons, exercising its intellectual powers. My soul hopes, doubts, loves, hates, exercising its sentient powers. My soul wills, determines; exercising its volitional powers. Demonstration necessitates the mental states of the soul. Interest necessitates the sentient states of the soul. The volition (free as the God that made the soul) is not necessitated; and determines often against the necessitated states of the soul, mentally and sentiently. Living saving faith in God, is the action of the soul, 1st, intellectually, knowing the truth, 2d, sentiently, feeling the truth, 3d, determining upon the truth. I demonstrate the soul's depravity and its doom: then prove Christ a Saviour from the sin and doom. I appeal to the soul, through its sentient faculties, till it *feels* the importance of these truths; the soul then turns the arch of purpose, accepting Christ, and it is saved. The soul, the whole soul has believed and this is more than a mind-faith; it is the belief "with the heart (sentient) unto righteousness."

MEDIATOR BETWEEN SCIENCE AND RELIGION.

BY JAMES W. LOWBER, PH. D.

THE Physicists of the present time are far from being true to the original meaning of science. Science originally denoted knowledge; but now there are many things called science, that are mere speculations. Nature when properly interpreted, always tells the truth; but there are afloat in the world as many incorrect theories of science, as there are untrue systems of religion. At the time

of Jacobinism in France, that country was flooded with more than seventy Geological theories; all of which were supposed to contradict the Mosaic Cosmogony. None of these theories has stood the test of time, while Genesis is now read by more people than ever before, and its truthfulness impresses the human mind more and more as civilization advances. There is nothing more uncertain in this world than the various theories based upon an effort to interpret Nature. Everything is so uncertain that the text-books in science have to be changed every few years.

There can be no conflict between the reasoning part of man's nature and the religious part; nor can there be any contradiction between God's will impressed upon Nature, and His will revealed in the Bible. The man, who studies nothing except the physical sciences, is apt to become one-sided, and conclude that there is no truth not included in his special department of study. The difficulty in his case is the fact that he is not religious enough to form a correct judgment with regard to religious subjects.

Man has in his nature a religious element, the development of which is just as scientific as the development of reason. As the Bible contains the truest and purest form of religion, it is better calculated to develop man's religious nature than any other book. While we fully believe in the infallibility of the Bible, we are far from believing in the infallibility of all the theories based upon it. The Bible has been abused in the hands of its friends, and some have endeavored to make it teach on scientific subjects exactly the opposite to what it really teaches. Scientists have held the Bible responsible for the false theories which some have tried to deduce from it. In this way science and the Bible have been regarded by many as the antipodes of each other. In order that man may properly judge of the true relation of science to religion, it is not only necessary for him to study the Bible, but he must, also, study God's unwritten word.

The true mediator between science and religion, I believe to be philosophy. For about three centuries, the world has been agitated by an unnatural strife between the scientific and religious classes. Many battles have been fought, and much learning expended; but the longer the war continues, the more hostile the parties become. Several positions have been developed with regard to the reconciliation between science and religion. There are the Extremists, who believe a reconciliation impossible; another class called Indifferentists, care nothing about the subject; the Skeptics are opposed to it. It now remains for the true

philosopher to go to work in earnest in order to unite that which should never have been separated.

The objector states that philosophy has also had extreme tendencies. The history of both ancient and modern philosophy verifies the truth of this statement. It appears that the philosophical tendency in both ancient and modern times has been the same. Platonism and Aristotelianism were antipodal; the one idealistic and the other realistic. Germany and France represent the same tendencies in modern, that those individuals represented in ancient times. We find the truth in the golden mean between extremes. It appears to me that eclecticism presents the true spirit of philosophy. Many that have been called philosophers, might more properly be termed sophists, if we name them according to their conception of themselves; for the sophist imagined that he possessed superior mental acumen. Self he regarded as the standard of perfection. This prepared him to reject a revelation from God; for he looked upon his own commanding intellect, as sufficient to investigate the past, scrutinize the present, and determine the future. Let us, then, avoid both the extremes of nescience and omniscience, and with the true philosophic spirit, study God's written and unwritten word, and show the perfect harmony which exists between them.

CAUSE OF MATERIAL THINGS.

BY REV. STEPHEN WOOD.

A WRITER in the *Evangelist* (Chicago), as quoted in an editorial of the January number of *The Microcosm*, says: "I can conceive of a being that is able to create or make something out of nothing."

Paul tells the Hebrews that "we understand that the worlds were formed by the word of God, so that things that are seen were not made of things that do appear."

How any one "can conceive of a being that is able to create or make something out of nothing," when the human mind from its very nature and constitution, is utterly incapable of forming a conception of the *fact*, is incomprehensible. I consider Paul's view of the subject much more tenable and certainly more intelligible. It is not necessary to conclude that matter is eternal. We sometimes get into difficulties by not having a clear conception of the force or meaning of the terms used. Infinity has no comparison with space, nor can eternity be compared with time, however extended; they may be set in contrast, but not in reference to the *length* of time, nor to the

extension of space; they do not exist on the same plane. All space is no part of the infinite nor is any length of time or all time any part of the eternal. The assumption that God created all things from nothing, is not only untenable, but quite unintelligible. And the proposition that God created all things from coexistent, and therefore self-existent, substance leads to an unending labyrinth of absurdities. But that God created all things from Himself, may be readily comprehended by any one who is familiar with the law of discrete or separate degrees; as *end*, *cause* and effect. These degrees may be illustrated by familiar examples; as, *will*, thoughts and act. The will is the *end* from which the cause emanates and from which the *act* exists, and the thought is the *cause* by which it exists.

When the will flows out into the thought, it has created something from itself, which is not itself. The will suffers no loss in this efflux, yet there has been a substantial proceeding from it, which is the first limit; and although the thought is so separated from the will as to form no part of it, yet the will is active in the thought, and by it produces the act, which is the *end* ultimated, limited or finished. The act is an image of the will.

There can be no action without something to act, and there can be no efflux or proceeding, unless something proceeds.

God created all things from Himself; all these created things are no part of God; the Divine substance from which all created things are and exist, is infinite and eternal; but the things that are created from this Divine substance, are not divine, nor are they any part of the infinite and eternal, therefore they are no part of God.

"There must be, in every proceeding, end, cause and effect." It is well known that the effect is no part of the cause; that they exist on separate planes, and yet the cause is within the effect as its *substance*; so God, as the great first cause, is within all created things as their substance; and if He should withdraw Himself, all created things cease to be.

There is no continuity between the Creator and the created, but the connection is most perfect and essential. This connection is made and sustained by influx into Nature from the Divine. The same Divine effluence or proceeding, that caused physical things to be, is ever continued to sustain and preserve them. "Preservation is continued creation." This influx to Nature, is by steps, or discrete degrees, which may be illustrated by an edict proceeding from an Emperor, who is absolute Monarch. The edict is the first effect of which

the will of the Monarch is the end, and his thoughts, proceeding, are the cause. This edict may be the cause of other acts, and these the cause of others in a long series; but in whatever degree or link in the chain, we may view it, we shall find that the immediate cause of that particular act is in the preceding step; but the will of the Emperor is within as the substance, in whatever link we may view it, until it terminates or is fully ultimated.

We may see something of the series in the creation process. If we study the facts closely, we shall find that all life, of whatever form or degree, that exists upon the earth, is derived from the sun; that all the changes that are wrought upon the earth are caused by the sun; that the very place that the earth holds in the universe is due to the sun; we may therefore conclude that the earth owes its origin to the sun, as the nearest cause. Although the sun is natural substance, it is a discrete degree above the natural substances of the planets.

No one need doubt the possibility of a still higher substance, by which the sun itself exists and subsists. This higher substance we may call spiritual substance. The sun receives constant influx from this higher substance, as the earth receives a similar influx from the sun. It is the influx of this living substantial force into the sun which causes its extreme activities; and it is the activities (caused by this living force) of the sun's substances, that enable it to send off its influence to a lower plane, which the earth receives in common with the other planets. "There are but two things in Nature, viz: force and matter." All force, of whatever kind, or by whatever name it may be known in the solar system, may be traced, directly or indirectly, immediately or mediately to the sun; and as the sun must be constantly sustained by this higher spiritual substance, so this must be constantly sustained by influx from the Divine substance, which is self-existent, or life itself. No lower forms of substance are self-existent, nor have any life of their own, but in all cases, the activities of such forms are from the inflowing life through a superior degree, from this one source of life and energy. This influx from the Divine is always the same.

"In Him is no variableness or shadow of turning."

"He is the same yesterday, to-day and forever."

GENEROSITY TOWARD OPPONENTS.

Harbor Springs, Mich.

A. WILFORD HALL:

Dear Sir:—I write to express the great pleasure the reading of "The Microcosm"

affords me personally. I am sure you will have the sympathy and well wishes of every intelligent and good man who understands your position, and the work you are so ably doing.

The change in the form and price of the paper will most certainly be welcomed universally by the subscribers.

One thing in the paper, to my mind at least, is to be regretted, i. e., the want of a *kinder magnanimity* in the spirit of some of the articles contributed. Scientists from whom we differ are spoken of as a "Corporation of parrots who chatter away their lives," &c. A champion has arisen, 'tis true. The battle seems to be turning in our favor; but we can afford to be generous can we not?

Yours very truly, JOSEPH CLEMENTS,
Pastor of the Presbyterian Church.

THE DANGER OF COMETS.

PROF. PROCTOR, the eminent lecturer and writer on Astronomical Subjects, has succeeded in producing a genuine scare, even among scientific thinkers, by predicting the destruction of this earth, or at least of all its living inhabitants, by the falling of a comet into the sun before the close of the present century. This terrible catastrophe he soberly reasons out by supposing that the comet seen in the southern heavens two years ago is the same as that seen in 1843, and this the same as that which appeared in 1668.

Now these suppositions may all be correct. If so, it follows that this particular comet, in its passage around the sun, is each time lessening the period of its return, caused, as is supposed, by its near approach to the central orb, and by the dragging of its tail through the sun's corona. This rate of retardation in the comet's visits makes its next return due in about fifteen years which is to be its final trip when, according to Proctor, it will haul off from the circuit, not for repairs, but for the purpose of taking a hot bath in the sun. This being admitted, the Professor then proves by the usual calculations of science that the sudden stoppage of the momentum of so large a body and the conversion of this mechanical energy into heat, would probably so augment the heat of the sun as to cause a flash that would last probably three or four days, and probably destroy the inhabitants of this earth. While there are rather too many "probabilities" mixed up in this calculation there is no question if the sun's heat were suddenly quadrupled or sextupled as Prof. Proctor assumes, that no animal life could remain on this earth under such a scorching influence even for the term of two or three days. To confirm the truth of his suppositions

in regard to this sudden augmentation of heat the Professor refers to the fact that a small star in the Northern Crown (which is no doubt a sun like our own, and the centre of a system of planets, comets, etc.) a few years ago was observed by astronomers to burst out with great brilliancy many times in fact that of its ordinary magnitude and then subside in a few days to its normal appearance. He then assumes, as the only probable way of accounting for this sudden brilliancy, that one of its comets must have fallen into its molten mass, and in this manner added to its fuel by the conversion of its momentum into heat as the result of the act of collision, &c. All this looks very pretty and scientific on paper and when told by such a scholarly and finished writer as Prof. Proctor, it seems almost like sacrilege to doubt its correctness, or even to gaze upon it with a critic's eye. But nevertheless we have some serious objections to our author's reasoning. Admitting the possibility of the fall of a comet into the sun, as supposed, is there any truth or reason in the received scientific view that such collision would cause an appreciable increase of the sun's heat? We deny the premises in toto, and will undertake to show that all this talk about heat as the equivalent of momentum developed by the collision of two bodies is scientific twaddle of the most superficial stamp, having no foundation in reason or observed facts.

In the first place it is plain if a comet should fall into the sun, its only possible means of increasing solar heat must be by this supposed conversion of momentum into caloric, since the comet is evidently as cold as an iceberg having just emerged from the rayless depth of space. It is clear that the addition of such a cold mass to the sun would rather tend to cool it off than to augment its heat. As well talk of adding fuel to a furnace by throwing into it a cake of ice! Unless the received view be correct, that the sudden stoppage of momentum tends to generate intense heat, it is plain that this earth or a thousand such planets falling at one time into the sun instead of increasing its heat would cool it off so as to cause a chilling effect this distance from the sun. The only possible cause, therefore, for the augmentation of the sun's heat by the collision of a comet or a hundred comets must arise from this so-called conversion of momentum, by sudden stoppage, into heat.

But look at its fallacy as shown by a plain illustration. A leaden bullet fired against an iron target with force sufficient to flatten it out into a thin sheet is undoubtedly stopped very suddenly. But is it melted by the collision? Not at all, though one of the most fusible of

metals. It is barely warmed to the touch if instantly picked up after striking. If there be any truth in the scientific view why is the bullet not melted? Ingersoll in his "Mistakes of Moses" learnedly assures us that if this earth had been suddenly stopped in its rotary motion to allow the sun apparently to stand still, it would have burnt up the earth or converted it into incandescent vapor, and that, too, without collision with anything; notwithstanding the swiftest portion of the earth's rotating surface does not move more than about half as fast as the rifle bullet, which is barely warmed by a dead collision! Of course Ingersoll reasoned logically and scientifically, and gives us a fair illustration of the pitiable nonsense that is hurled at the Bible from the scientific catapults of our modern materialistic philosophers.

But if it be objected that the motion of a bullet is too slow to illustrate the effect of a comet falling into the sun, by which its momentum is to be converted into heat sufficient to burn up the inhabitants of this earth, let us try to enlighten such a sapient critic by proving point blank that the fall of a comet upon this earth produces no heat whatever by the compact. This is demonstrated by the actual fall of fragments of comets (meteorites) weighing more than a ton, striking the earth without the slightest augmentation of their heat which they had already attained by friction in passing through our atmosphere. These miniature comets have been observed to strike the ground with no more effect by the collision, so far as melting the meteorite or the ground struck, than if a mass of the same size and temperature had been gently laid upon the same spot of earth. Mechanical energy can be converted into intense heat by friction, but it is the most egregious scientific nonsense, contradicted by every-day facts and observation, that any dangerous heat can be generated by collision or sudden stoppage, even of a comet, should it fall into the sun. The truth is, the effect of the collision of two bodies of equal mass, one cold and the other hot, can only be to cool the hot one just as much as the cold one is heated by the transfer of the heat of the one to the other, and here is where the true idea of "equivalents" comes in. So much for this scientific scare, and the "science" upon which it is based.

But Prof. Proctor proves his view *probably* correct by reference to the star in the Northern Crown which lighted up suddenly and then cooled off in a few days! Another great absurdity is here involved. Should our sun or any other sun be lighted up to many times its normal brilliancy by the sudden addition of an enormous mass of cometic fuel, as Prof. Pro-

tor assumes, it is worse than puerility to suppose that such manifold heat and light would subside and disappear in a few days. Manifestly nothing less than a few million years would make any perceptible diminution of such intense augmentation of heat, and it is strange that a great mathematician and astronomer should have overlooked such a self-evident philosophical truth.

How, then, is the sudden augmentation of light in that distant star to be explained—an augmentation which can so entirely subside in the space of a few days? Plainly there is but one such kind of illumination possible, or which comes within human observation, and that is an electrical display somewhat similar to our *aurora borealis*. Such a flash while producing little or no perceptible heat, might so light up a central sun as vastly to augment its brilliancy and might as suddenly subside without deranging its system of planets or perceptibly increasing their temperature, any more than we are now affected by one of our brilliant displays of northern lights. While such a display on a large scale fully solves the problem, it is the only conceivable class of phenomena that could so suddenly appear and then subside. We must insist that a little common sense mixed up with modern science would make it much more digestible to the average intellectual stomach.

Should Prof. Proctor chance to discover another astronomical mare's nest, instead of hastily publishing a book to frighten people out of their senses, let him write to *The Microcosm* and we will try to help him out of his trouble.

A MINISTER TURNS ATHEIST.

A FEW weeks ago a thrill of horror was sent through the Christian world by the public announcement that the Rev. George C. Miln, of Chicago, had renounced the Bible and publicly avowed himself an atheist. At first we disbelieved the report for various reasons, having known Mr. Miln while he was a Congregational minister in Brooklyn, before he had become a Unitarian and accepted the call to Chicago. We regarded him as a man of prudent sense and of a kindly heart toward humanity, and hence could not believe it possible that under any impulse of paroxysmal doubt he should give way to such a useless, sensational freak and deliberately wound the hearts of his friends, and cast a pall of sorrow and sadness over the hopes of tens of thousands of Christian families. Suppose a minister should have doubts flash across his mind that momentarily obscure the effulgence of the Sun of Righteousness. Has a man who is really good

at heart no other mission in the pulpit than to nurse his doubts and augment his misgivings by ransacking the Bible for apparent discrepancies and studying Tom Paine and the lectures of Colonel Ingersoll for jokes against the efficacy of prayer? Suppose Christianity to be a fraud and the Bible to be of human origin, what does Mr. Miln propose as a substitute to the millions of hearts that now lean upon the blessed hope of a future life which that religion and that volume inspire? Does he propose any thing? So far from it, he lectures in a large hall in this city and, amid the applause of atheists, quotes from Ingersoll, denounces prayer, laughs at the Bible, spurns any evidence of the existence of God, ignores his own soul as but a puff of air, and consigns humanity at death to a wakeless annihilation. Even Ingersoll could say at the grave of a friend's child, when urged to speak recently at the City of Washington, that he was not sure that all hope terminated at death. But his follower, Miln, boldly denies any such possibility of conscious immortality for man beyond the present life, and says to the mother who looks upon the cold form of her darling child that your hope of meeting again is a groundless deception. The wrung heart of this despairing mother appeals to her former pastor for one ray of consolation, but he turns to her with contempt curling his lips, and answers, no God, no future! For what is this cruel change of front? Had his doubts become too strong to permit his longer occupying the pulpit, there were a hundred channels of useful business for a man of such ability. Why could he not have stepped down quietly, and let blissful ignorance of his mental change shield to some extent the point of the dagger he has thus purposely and maliciously thrust into a million hearts? No, the truth must be told. He saw a field open for a new sensation. He saw his slim audiences growing slimmer. He saw crowds shouting themselves hoarse at the lectures of Ingersoll against God and the Bible. And he decided to share in this glory at the expense of human happiness and the utter extinction of human hopes. But watch the results of his new missionary work. Whenever any drunkard is reclaimed by his teaching; whenever any thief's conscience is awakened to the return of stolen money; whenever the tears of a bereaved and heart-broken mother are dried and a smile of joy made to take the place of sadness upon her face by his materialistic harangues, then let some one of his new admirers report it to *The Microcosm* and it will be published as a rare item of news. No such fruits, however, are to be expected, but right the reverse, and he evi-

dently knows it. Ambition to be heard and applauded by large audiences has manifestly turned his head and caused perhaps honest doubts, which might have been suppressed and changed to stronger faith, to become the basis of a selfish unbelief that has culminated in a public crusade against all that enobles and blesses the human race.

No man with such a heart should be trusted as a friend. He who would snatch from a bereaved mother the hope which was her only solace, without proffering her something in return save the cheerless gloom of atheism, would be equal to the heartlessness of throwing aloes into her soup-tureen to embitter the pleasure of her meal. Such a spiritual misanthrope could scatter capsicum upon the floor of a crowded audience and take pleasure in sitting upon the platform and watching the people rub their eyes, if it would only be considered smart. Such a social monstrosity could stick pins into babies and take satisfaction in hearing them cry. Let no such man be trusted. Stay away from his incendiary harangues against religion as you would shun a lecture for the instigation of treason and assassination. Pass him by in the street as you would give a wide berth to one fresh from the pest-house. Let him gratify his soul-less ambition for applause among congenial spirits who have so often applauded the same arguments from the lips of Ingersoll. But let no countenance be shown him by any who do not wish to blight the future of humanity by blotting from the earth the last hope of civilization.

NEWTON AND GRAVITATION.

As expected we have stirred up a scientific hornet's nest in our criticism of Newton's law of gravitation. We have scores of letters already from professors of mathematics and astronomy, some of which approve of our arguments, and others criticise them, though in a kindly spirit. We do not propose to close *The Microcosm* against a thorough investigation of this subject, but we intend to arrange for a complete discussion of our positions and arguments. To this end we shall select one professor of astronomy entirely competent to overthrow our arguments if they can be overthrown, and let him have full opportunity in a series of articles, of moderate length, accompanied with our own replies.

In selecting our man we know of no one more competent than Prof. S. B. Goodenow, from whose letters we made long extracts in the February *Microcosm*. Prof. Goodenow has thoroughly studied the subject, has taught astronomy for years in colleges, and has writ-

ten a book on gravitation and astronomy. And what is better, in the premises, he is thoroughly convinced, as he writes, that we are wrong and that Newton was right, and intimates that he would be pleased to make this appear in the columns of *The Microcosm*. The particulars of this friendly discussion will be announced next month.

INDECIPHERABLE WRITING.

WHY is it that many men of intelligence, in writing the names of subscribers, take no pains to make the letters distinct and legible? They seem to think because they are familiar with a man's name, that a clerk in this office must also know it. We are provoked sometimes beyond measure at this inexcusable want of care, as it is often impossible to determine a man's true name or proper address, which many times causes his paper to go wrong, and then we are blamed.

Let every agent or individual remember that *proper names* should be written as plainly as if printed, whatever liberty a writer may take in rattling off ordinary correspondence. Ninetenths of all the papers which go astray in the mails may be traced to the above culpable neglect. A majority however, of our agents, are not liable to this reproof, as they are careful to a fault.

HINTS TO OUR CONTRIBUTORS.

We have many good articles sent to us for publication in *The Microcosm*, which we cannot print, from the simple fact that we have not time to go over them and put them in shape for the average compositor. Some of these articles are written with blunt pencils, even on brownish paper, making the words scarcely decipherable; others are conspicuous for a total absence of anything like correct punctuation or capitalizing of sentences. It is surprising to note how many who pass for educated men, and even writers for the press, are liable to the above censure. Many of these defective articles would have appeared in this paper, but for want of time properly to edit them, as they are full of original thoughts which ought to be given to the world.

Correspondents should bear in mind that nothing makes so favorable an impression on the mind of the busy editor when opening a manuscript designed for his paper, as to find it carefully written with ink, on one side of white sheets, and accurately punctuated; while nothing is so well calculated to prejudice his mind at the start, as to observe the reverse of the above, and especially to see mis-spelled words in the first sentences. One other objection to

many articles otherwise good, is their undue length. We must limit our contributors to about one column, or at most to one and a half.

HINT TO AGENTS.

MANY persons send us one or two subscriptions and request us to keep an account of them, and they will send more, and when they have sent enough for the premium we are expected to send it, etc. Now recollect we cannot, in our hurry, keep such accounts with agents. It costs too much for bookkeeping. Subscriptions in order to receive the premiums offered; must be sent at one time. Let those who are working for a premium keep their names till they have the number necessary, and then send them with the money and save us a deal of bother and correspondence.

DISTINGUISHED MEN.—No. 5.



PROFESSOR HAECKEL.

ERNST HEINRICH HAECKEL was born in Potsdam, Prussia, Feb. 16th, 1834. He is consequently now 48 years old. For one of his age, he is, no doubt, now the most thorough scholar in all departments of natural science in Germany. He has been for many years professor of Natural History in the University of Jena, and has written several of the most learned and elaborate works on Biology that have come from the German press. As an evolutionist, and a writer in its defense, he stands second to no one, not even to Mr. Darwin. His two greatest works on this subject are his *History of Creation*, in two volumes, and his *Evolution of Man*, two volumes, making, in connection with Mr. Darwin's *Origin of Species*, about all that any inquirer need have to constitute a complete library on that subject. Of course Haeckel has to some extent supplanted Darwin in the esteem of advanced Scientists as an evolution writer. This

is due to the fact that he is the more consistent of the two, as he does not even by remote allusion recognize an intelligent Creator of the universe or even of the first simple forms of life. He boldly denies the necessity of a God, but on the contrary holds that the first living forms (*monera*) were spontaneously generated out of inorganic matter, and that from these, all animal organisms, even that of man, have been evolved by means of environment, struggle for existence, natural selection, and survival of the fittest!

Prof. Haeckel, whatever objection one may make to his atheistic theory, must be regarded as one of the most indefatigable students and investigators of modern times. One is surprised, on examination of his leading works, at the immense store of knowledge he must have acquired in so short a time. What he will achieve in twenty years to come, should he live, it will be difficult to guess. It is to be hoped that he will find out by that time that there is a God.

MAGNETISM AGAINST MATERIALISM.

IN the last number of *The Microcosm* we presented the above subject in an editorial, in which we incidentally stated that we could send any person desiring it a good *steel horse-shoe magnet* for fifty-five cents, which would include postage. We are astonished at the response of our subscribers, and at the numbers of orders we are already receiving for these invaluable little demonstrators of God's presence in Nature. We trust our readers will pardon the gratification and even elation we feel at the manner in which this argument on the substantial nature of force is received. Many of our scientific readers write us, pronouncing the argument against materialism based on the action of a steel magnet, the most telling blow in favor of religion and the reasonable probability of a future life, that has ever been struck. We still firmly believe that no candid skeptic can fully grasp the force of this argument without having his doubts of a probable future existence shattered; and we believe if the American Bible Society would add a steel magnet with every Bible they distribute, they would more than quadruple its effectiveness in turning doubters on the subject of religion from darkness to light, and from the power of Satan to God.

HYDRAULIC PRESSURE.

PRESIDENT C. J. KEPHART, of Avalon College, Mo., writes to us propounding certain queries with reference to our replies to his brother's objections, as printed in the *Problem of Human*

Life, at pages 347 to 350. He thinks the difficulties he has now suggested help the wave-theory of sound, and go to show how it might be possible for an insect, by stridulating, to shake four cubic miles of air into condensations and rarefactions, with a force sufficient, as we demonstrate in the "Problem," if the wave-theory be true, to bend 2,000,000,000 tons of tympanic membranes out and in 440 times a second, &c. We will give one of his illustrations complete, as an example of all. It is as follows.

"Let us suppose that we have a hydraulic press whose piston is 10 feet square. Let the cylinder be filled with water to a depth of one foot, and the piston be supported on the surface of the water by supports from beneath. Let ninety-nine cubic feet of lead, weighing 69,696 pounds be placed on the piston. Let the vacant square foot [in the centre] be conceived to be cut out. Now suppose a bar of lead one foot square and two feet long to be lowered into the water through the vacant square [of course air-tight and without friction]. For every inch that the bar descends the piston with its load rises one *ninety-ninth* of an inch. If the bar descends twelve inches the piston will rise *twelve ninety-ninths* of an inch. That is, a force of 1408 pounds, minus the weight of the water removed, in some way displaces a weight of 69,696 pounds. How do you explain it?"

Answer: Easily enough. In the first place there is no similarity in this hydraulic action and the effect of dropping a cubic foot of lead into an open tank, as supposed by Professor I. L. Kephart, and to which our reply was made in the "Problem." In one case the lead has nothing to do, but to displace a cubic foot of water and let gravity distribute it over the surface of the supposed tank. But in the case illustrated above the water is confined in a closed tank which brings it under another law entirely different, that of hydraulic pressure—How then do the two cubic feet of lead raise the 99 cubic feet *one ninety-ninth* as high as the bar of lead sinks? We answer, on the principle of the wedge. The particles of water, being substantially frictionless, are caused to roll or slide by each other and to act with equal force under all parts of this supposed piston. In other words, a thin sheet of water, instead of being spread out over the tank's surface by the direct action of gravity, has to be forced out like a thin and fractionless *wedge* by the weight of the bar of lead, and by this mode of *leverage* is caused to lift the weight, resting on the water, one *ninety-ninth* as much as the bar sinks. President Kephart would have no difficulty in comprehending how 99 cubic feet of lead on the short end of a lever could be raised by one cubic foot of lead on the long end, provided it had *ninety-nine times*, and a little more the advantage in length of lever, or the same result

if it had *ninety-nine times* the advantage in *wedge* power, which amounts to the same thing in mechanics. But what this illustration of *confined* water or *confined* air has to do with the sinking of a pebble in the *open* ocean, or the movement of a locust's legs in the *free* air, is more than we can divine, and we have tried our *divining* powers upon it to their full capacity.

THE "IGNORANCE CLUB"

We have received a letter from Mrs. M. K. Boyd, Matron of the Western House of Refuge, at Rochester, N. Y., giving us a description of a club recently organized there for the exclusive benefit of women, under the above-named expressive designation. The object and purposes of the society are implied by the name it has chosen. The members meet alone for intellectual culture, improvement, and social enjoyment. One feature of the entertainment is the reading of a paper by some one of the members, previously appointed (ladies only being admitted), which is discussed pro and con by any who may choose to take part. The society then resolves itself into the feature which gives it the name it bears. Each member seeks information upon any subject upon which she may have been studying, by presenting questions in writing. These questions are read to the club by the president or secretary, after which any lady present is permitted to answer, thus furnishing the information desired. The questions are permitted to embrace all classes of human knowledge—history, politics, science, philosophy, religion, etc. Should any questions remain unanswered to the satisfaction of the interrogators, such queries are handed out to such members as may choose to take them for the purpose of obtaining the desired information, either through their own researches or by the assistance of some friend, and presenting it at the next meeting. From what we can gather from our correspondent the meetings have already become intensely lively and entertaining. We do not see why ladies might not thus vie with the proudest clubs in the land, of the opposite sex, and in this way do much for their own intellectual culture and amusement.

MAGAZINE EXPLOSIONS.

BURLINGTON, IOWA.

Editor of the *Microcosm*:

I was amused to-day in reading your remarks concerning the Magazine explosion at Oskaloosa, Iowa, as given in the Feb. No. of *The Microcosm*.

I was at Oskaloosa very soon after the ex-

plosion occurred, and saw the effects of the "sonorous wave" or "sound-pulse," as Prof. Tyndall would call it, sent off by the "sounding instrument" the exploding Magazine. It seems to me that some of the phenomena go plainly to prove your position true, namely, that the compressed air-wave which, on such occasions, crushes in windows, doors, etc., is not identical with the sound-pulse. A Mr. Hoffman whose house stood about 400 yards from the place of explosion, informed me that he was seated in the house at the time, but did not hear the sound. This I think may be accounted for by the fact that the shock which crushed the windows of his house reached him in advance of the sound, and so excited him that he did not notice the sound when it came. Mrs. H. and the nurse both say they felt the jar of the house first, (evidently caused by the ground's tremor), then came the crash of broken doors and windows, caused by the air-wave, and last of all the sound of the explosion. Others in the city told me they could easily detect the difference in time between the shock which broke the windows, and the sound,—the latter always following the former.

Thus it would seem that it was not the sound-pulse that broke the windows, etc., as the advocates of the wave theory teach.

Yours for the truth,
M. L. VORHEIS.

The Rev. J. H. Kline, of Reynoldsville, Pa., bears testimony to the same effect in describing the result of an oil tank explosion, that took place at Parker City, Pa., some time ago. He says :

"I was in the city at the time, at a distance of half a mile from the exploding tank. The front street of Parker City contains quite a number of large glass fronts. These, with nearly every window along the river side toward the source of the explosion were shattered to atoms by the compressed air-wave. But the period intervening between the breaking of the glass, and the arrival of the sound of the explosion was quite perceptible, being something more than a second, which seemed to me positive demonstration of the correctness of your position, that the sound-pulse and accompanying condensation are two distinct phenomena. It is also manifest that any other sound, at which gas is generated, like that of a falling tree, would produce no concussive shock whatever. I am astonished that the great authorities you have reviewed, could not have caught this distinction so self-evident on its face."

REMARKS.

The writer of the first letter above—the Rev. Mr. Vorheis—doubtless was not aware that we had predicted with great particularity the very result of an explosion which he has so clearly described. We foretold without having tried

an experiment that the compressed air-wave at an exploding magazine must act as here observed, and hence that it was a manifest error in Professor Tyndall and other authorities on sound to make the condensation, which shattered windows at a distance, identical with the sound of the explosion. If Mr. Vorheis will turn to pages 104 to 115, *Problem of Human Life*, he will find this very prediction recorded in opposition to Prof. Tyndall's teaching, namely, that near to a magazine the concussive shock caused by the air-wave will outstrip the sound, and be felt before the report is heard; but that at a great distance from the magazine the sound will overtake and pass the condensation, and be heard some seconds in advance of it! This we explained to be simply because the sound travels with one uniform velocity from the start (about 1120 feet a second), while the compressed wave, caused by the sudden addition of gas to the air, travels with its greatest velocity at the start where the condensation is strongest, and gets slower and slower as the ever-expanding wave becomes less and less compressed, till finally it will travel no faster, perhaps, than a man can walk! We repeat this prediction and detailed explanation (still without having tried an experiment) in our article on "Magazine Explosions" in the October number of *The Microcosm*.

We thank the Rev. Messrs. Vorheis and Kline, for their splendid confirmation of the correctness of our position, which we have urged upon colleges to test experimentally and expose if we were in error. But no college so far has seemed disposed to waste even a keg of powder, to show its students the fallacy of the current theory of sound, preferring, as we must conclude, to continue to teach the old theory, that a "sound-pulse" will break windows, destroy houses, tear men and animals to fragments, all because it is so laid down in the text-books! We propose to stir them up occasionally, by way of a reminder in *The Microcosm*, and hope they will take no offense, as there is none intended.

PROF. KEPHART'S LETTER.

LEBANON, Pa., March 15th, 1882.

A. WILFORD HALL.

Dear Sir:—Having carefully examined your illustrated review of "Newton, on Gravitation," which appears in the March issue of *The Microcosm*, I lose no time in expressing my unqualified indorsement of your position; and I desire to say that in my opinion you have done all you promised to do, namely, to "demonstrate" to the entire satisfaction of candid in-

investigators that gravity does not vary inversely as the square of the distance from the earth, taking the earth's radius as the unit of measure. This you have done conclusively, and you will please accept my congratulations. The conception of the incorrectness of Newton's law, and your clear demonstration of that fact are a sufficient reward for the efforts of a lifetime, and must compel your pseudo scientific critics to accord to your opinions the respect due the utterances of one who is recognized as standing in the front rank of scientific investigators. This I say not to flatter you (for I believe you to be above such vanity), but because your work entitles you to this consideration, and because I wish to give your efforts the small benefit of my unqualified approval.

I have also carefully read your criticism of Dr. P. H. Van Der Weyde's statement respecting the descent of bodies projected horizontally, and although the position on this point taken by the Doctor is not original with him (having been taught for many years in our text books), nevertheless here again you come out victorious and show most conclusively that both the Doctor and the text-books are wrong. But I will say no more. In behalf of our common Christianity I desire to thank you for the great service you are rendering the cause of TRUTH by showing that it is possible for even the greatest scientists to make mistakes in their investigations and to arrive at false conclusions. The success of your efforts in this direction must prove of inestimable value to the interests of both science and religion, as it will hereafter cause thoughtful investigators to stop and consider well the probable correctness of a scientific theory which opposes Divine Revelation, before abruptly throwing away their Bibles. Congratulating you upon the unprecedented success of *The Microcosm* and the tremendous sale of the *Problem of Human Life*, and praying God's blessing upon your labors, I remain,

Very sincerely Yours, I. L. KEPHART.

"THE GOSPEL OF DIRT."

BY COL. JOHN M. PATTON.

MATERIALISTIC evolution is classed by its friends as the *New Philosophy*. The designation as above given, is that of Thomas Carlyle. Under any designation it lands us in a dreary atheism. The doctrine itself is perhaps as old as profane history. In its better form it is found in the misty historic, or prehistoric centuries—in the religion of Zoroaster, but after that purest of all forms of unscriptural faith had been somewhat corrupted. Prof. Whitney placed the age of Zoroaster at least 1,000 years

before the Christian era; Dr. Haug from 1,000 to 1,500 years, and Spiegel 2,000 years, (*Vide, "The Wise Men of the East,"* p. 201.) A feeble echo comes to us from those distant shores of historic time, informing us that in the beginning Ormuzd, the great creator of all good things (in spite of his diabolical rival Ahriman) placed in a *single* germ the "promise and the potency" (as Mr. Tyndall calls it) of all things. This doctrine has been bruited abroad, in some of its forms, in successive ages, ever since; and has as often sunk into neglect. The old Greeks—Anaximander, Anaxagoras, Democritus, and Epicurus maintained it. In the early part of this century it was displayed by Lamark, St. Hilaire, St. Vincent, La Place and others. (*Vide, Pater Mundi*, second series, p. 10.) Near half a century after, the brilliant author of the "*Vestiges of Creation*" taught it in a fascinating form; but soon fell, unwept, beneath the dreadful sword of the historian of the "Old Red Sandstone," and of the "Asterobpis of Stromness." And now in these last days, it rises from many graves in its worst form, lush, vigorous, its youth renewed, devouring systems of faith—the treasured comforts and consolations of men—and we must fight it or die.

Happily for us this terrible monster has always displayed a predisposition to suicide, and even when it has inclined to die by asphyxia instead of by sudden means, it has always found some Wilford, who impatient of the delay has subjected it to "the sword of the Lord and of Gideon." Each revival of false doctrine, as the age progresses, has been supported by two classes. First, by those having "itching ears," who are ever desirous "to see and hear some new thing." If that new thing commends itself to their imaginations, and at the same time relieves them of anxiety or responsibility, they passionately defend it until its authors give it up. This constitutes the great mass of its supporters. The learned upon whom they rely constitute the second class, and are generally specialists, like those whom C. F. Mivart describes as people whose "one thing" is the field of the microscope or the "anatomy of the lowest part of the hindmost bone of the skull of the carp." (*"Contemporary Evolution"* 1876, p. 134.) When such persons have their specialties and undertake wide generalizations outside of their spheres in regard to God and man,—their existence, their origin, and their destiny,—they often err most lamentably, even setting up their new doctrine as a god. Sooner or later the error becomes apparent to the meanest understanding, the doctrine itself ceases to be new, and its old adherents, recognizing it as exploded, rend

their god as Actæon was torn by his own dogs.

We have various evidences that the process of asphyxia had commenced when Wilford made his decisive assault in the second edition of "*The Problem*." 1st. The great Virchow lopped off the right hand of this mortal god when, not long ago, he slew Huxley's "*Bathybius*"—the *life-giver*. And for this he was soon treated as an Amalekite. He has been subjected to the sword of Haeckel and the house of evolution generally—the true Israel of the "new faith." Happily he can take care of himself. And, besides, the keen Damascus blade of Mr. Tyndall is his ally. So we should not fear for him. But what will become of Prof. Tyndall himself,—unless we are to consider him, by virtue of his frequent changes, as a privileged character, or a "free lance?" Both of them, however, may take comfort from the fact that at the "British Association" of science, at Sheffield, in August, 1879. Professor Huxley himself (after Virchow had reduced his false god to his proper proportions) amuses himself with that same god, calling him his "young friend, Bathybius,"—"that interesting Bathybius," etc.; and describing him, as "he is sorry to say," as not having "altogether verified the promise of his youth," and as one who "could not be found when he was wanted." (See the *Popular Science Monthly* of October, 1879, p. 862.) 2d. There is a charm about the great physicist—Prof. Tyndall—which is exceptional. He seems to be of an impetuous mind and temper, born of a fervent and enthusiastic nature. He is thus often led to put forth hasty theories and opinions—in-
deed, the exigencies of scientific investigation, due to its experimental character, are apt to develop this habit of mind. But he wins us by the *naivete* with which he shifts his ground. In illustration of *this*, the *prayer-test* with which he challenged the Christian world some years ago may be instanced. Not long after propounding this test, and other views, which were thought by the Christian world to be inimical to religion, he stated in one of his masterly lectures on science, something to this effect, that in his "better moments"—he thought differently of these views, or at least doubted them. In the same spirit this great scientist (as he undoubtedly is) in 1879, in a series of papers in the *Fortnightly Review*, put himself on record as at least no longer an advocate of the materialistic form of evolution. Below will be found some extracts from these papers, which should be recorded everywhere before he again changes his mind. I have not had access to the *Review* itself, but take the extracts from the *New York Observer* of October 16th, 1879.

Mark what is said by the great scientist, who

once declared that matter contained in itself the "promise and potency" of all life; and who once showed us in detail how the eagle eye could be evolved from a lump of mud. He at least denies that mind and consciousness can be so evolved.

"If asked to deduce from the physical interaction of the brain-molecules the least of the phenomena of sensation or thought, we must acknowledge our helplessness, * * * in passing from the one to the other, we meet a blank which the logic of deduction is unable to fill * * * we meet a problem which transcends any conceivable expansion of the powers which we now possess * * * A mighty mystery still looms beyond us. We have, in fact, made no step towards its solution * * * Religious feeling is as much a verity as any other part of human consciousness, and against it, on its objective side, the waves of science beat in vain. * * * It seemed high time to him (Virchow) to enter an earnest protest against the attempts that are made to proclaim the *problem of search as actual facts*, and the *opinions of scientists as actual science*. * * * We ought not, Virchow urges, to represent our conjecture as a certainty, nor our *hypothesis* as a *doctrine*. This is inadmissible. * * * Behind, and above, and around us the real mystery of the universe lies unsolved, and as far as we are concerned, is incapable of solution. The problem of connection of body and soul is as insoluble in its modern form as it was in the pre-scientific ages. * * * There ought to be a clear distinction made between science in the state of hypothesis and science in the state of fact. And inasmuch as it is still in its hypothetical stage, the ban of exclusion ought to fall upon the theory of evolution. * * * I hold with Virchow that the failures have been lamentable, that the doctrine is utterly discredited."

3d.—Nor is Professor Tyndall alone among the highest scientists in this support of Virchow—Prof. J. D. Allman, L.L.D., F.R.S., and president of the *British Association*, uses the following language in his inaugural address before that body, at the Sheffield meeting in August, 1879, his subject being "Protoplasm and Life." He alludes to the argument that "because life phenomena, which are invariably found in the cell must be regarded as a property of the cell, the phenomena of consciousness by which they are accompanied must be also so regarded." [One would think that it might as reasonably be supposed that the cell was a property of the life—but let that pass.] He further alluded to the argument of Prof. Huxley, that "no difference, however great, between the phenomena of living matter and those of the lifeless elements of which this matter is composed, should militate against our attributing to protoplasm the phenomena of life, as properties essentially inherent in it," and then proceeds: "I believe that Prof. Huxley intended to apply this argument to the phenomena of life in the stricter sense of the

word. As such it is conclusive. [Why?] But when it is pushed further and extended to the phenomena of consciousness, it loses all its force. The analogy, perfectly valid in the former case, here fails. * * * * * That consciousness is never manifested, except in the presence of cerebral matter, or of something like it, there can be no question; but this is a very different thing from its being a property of such matter, in the sense in which polarity is a property of the magnet, or irritability of protoplasm. * * * * * But have we, it may be asked, made in all this, one step forward towards an explanation of the phenomena of consciousness, or the discovery of its source? Assuredly not. The power of conceiving of a substance different from that of matter is still beyond the limits of human intelligence, and the physical or objective conditions, which are the concomitants of thought, are the only ones of which it is possible to prove anything, and the only ones whose study is of value."

With these three evidences of the asphyxia of modern materialism, I close this number; but propose, with your permission, to give further evidence against it, in the next *Microcosm*.

"KIND WORDS NEVER DIE."

HON. JOHN GILMER, of Pittsylvania, C. H., Va., a noted lawyer of the Old Dominion, writes to his friend, Col. J. M. Patton, who kindly sends it to us, as follows:—

"Encouraged by your high opinion of the *Problem of Human Life*, I read it last fall by snatches, for I hadn't time to go straight through it. My opinion is that it is by far the most powerful book (excepting always the Bible) I have ever read, and I am very incredulous as to any uninspired man having ever written so great a book. It is more remarkable for masterly and unanswerable reasoning than for anything else; while for satire, it throws Juvenal, Perseus, Junius, and Sidney Smith entirely in the shade. By the time his book reaches the zenith of its popularity, I have no doubt that the author will have done more for science than all the scientists he reviews, combined, have ever done, or will ever do; and what is more important, he will have done far more for the Christian religion than all the theologians combined who are vainly attempting to assail his unanswerable arguments. The faults of style, &c., so much harped upon by many, are like spots on the sun,—scarcely visible to the naked eye, and lost sight of in the overwhelming splendor."

Rev. W. H. ADAMS. Paint Creek. West Va., writes:—

"The *Problem of Human Life* is indeed 'the

book of the age,' and is very timely. It is wonderfully cogent and convincing; while *The Microcosm* is worth its weight in gold. It is as profound as it is grand and unique."

Rev. H. LYMAN, Cortland, N. Y., writes:—

"Wilford Hall—Sir: In all courts of jurisprudence, any tokens that the assailant struck and mangled his victim after he was dead, are held as evidences of malignity, deserving of additional penalty. Your treatment of the late Prof. Tyndall's remains calls this rule vividly to mind. How could you, after decapitating him, send his ghost abroad with a tin tube fifteen feet long with the smoke of brown paper in the wrong end, blowing out candles by puffs of air while calling them sound-pulses? What punishment do you not deserve in thus handing down to posterity our distinguished and scholarly professor as a scientific trickster—a mere thimble-rigging mountebank! That, sir, is something you will have to give an account for both 'here and hereafter.' Truly the *Problem* is an infinitely amusing book."

Rev. J. E. PROPHETER, Du Quoin, Ill., writes:

"I cannot refrain from expressing my gratification in reading your article on Newton and Gravitation in the March *Microcosm*. I was surprised that the clear-headed editor of the *Christian Standard* failed to see your point while admitting the fallacy of the radius unit. I confess that it was with a great deal of curiosity and some anxiety that I waited for the denouement after your positive forecast in the February *Microcosm*. We now feel something like the geographers in Spain felt when Columbus showed them how to make an egg stand on its end. Strange it did not occur to us before! How astronomers are going to show that the body at 1 weighs to the full value of the earth's gravity, when much of it pulls at partly contrary angles, is more than we can guess. I could loan the 'Problem' all the time, but I am trying to get people to go to them that sell and buy for themselves."

Rev. C. H. ROWLEY, Westfield, Mass., writes:

"Inclosed find \$1 for the *Walks and Words of Jesus*. I think what you recommend will be good. I have just received the February *Microcosm* and your article on *Pendulosity* shows conclusively your honesty. Long live *The Microcosm*. We are having a revival in our church and the *Problem of Human Life* will help it. Truth is one; and a revival in scientific truth means a revival in the church. Suffer a word from an admirer. Please don't be crowded too much. Look after your health and strength. Soon you may expect to see the fire fly! There will be a charging down upon you and you are to be the rock upon which the waves of criticism will split. Hold off as in

the February *Microcosm* and give time for expectancy, and yourself time for careful, strong work. God bless you and I will help you all I can.

C. H. ROWLEY,
Pas. Cong. Church."

Prof. J. F. YOUNG, B. A., Monticello, Ky., writes:—

"I have read the *Problem of Human Life*, and am an interested reader of *The Microcosm*. The *Problem* is unquestionably a most wonderful production, and I regard *The Microcosm* as the great religio-scientific journal of the nineteenth century."

Eld. J. P. MCCORKLE, Vacaville, Cal., writes:—

"I have read your book, the *Problem of Human Life*, and it is useless for me to try to express my gratification at the triumphant overthrow of Darwin and his cohorts. If this book had not been written, I do not know what would have been the result of present scientific investigations, as it was becoming more apparent that Darwinism was rapidly gaining ground and getting a firmer hold every year upon the hearts and intellects of the people, until the Bible seemed about to be dethroned. But thank God, deliverance has come at last, and materialistic infidelity has been driven to the wall. I love you for your work's sake, though I never saw you, and would be happy to shake your hand. I want your photograph, and will send you mine in return. Inclosed please find \$11 for a list of subscribers for *The Microcosm*."

Eld. G. L. SURBER, Dallas, Texas, writes:—

"Wilford Hall—You are doing a work that will tell on the ages, and tell for God and His kingdom long after you have left us. May kind heaven bless you with health and strength to continue the work to its final consummation."

Dr. M. V. MCKINNEY, Jeffersonville, Ind., writes:—

I feel a deep interest in the distribution of your most valuable work, the *Problem of Human Life*. It has forever settled the question, in the minds of all unprejudiced readers, as to the conflict, between science and religion. A single perusal of it will do more in establishing Christianity in the mind of one in doubt, than a hundred sermons."

R. P. LEWIS, (an avowed evolutionist, and a writer of some distinction,) East Saginaw, Mich., writes:—

"I sincerely think you are publishing the most useful paper in the world. Not the ablest in point of literary ability, not the most interesting to a superficial reader, but a paper that

presents newly discovered truths in simple language, gives a novel statement to old truths and exposes fearlessly anything it deems fallacious in science or philosophy. * * * My present impression is that you have knocked the bottom out of the wave-theory of sound, and that impression is so marked that I am amazed, stunned, disgusted (in fact I need a new word to express the blending of my various emotions), at the silence of Professors Tyndall, Helmholtz, and Mayer. If it is because they consider your objections to the old theory of sound frivolous, they are maintaining a 'heap' of dignity on rather a slim capital, for every reader of the *Problem of Human Life* knows that some of their 'science' is essentially false and ridiculous."

Elder A. J. SMITHSON, Kent, Mo., writes:—

"We get *The Microcosm* monthly, and revel in its wonderful scientific disclosures. I have read the *Problem of Human Life* with intense gratification. I have no words in which to express my appreciation of the force of its arguments better than to say—they are *overwhelmingly overwhelming!*"

Prof. W. H. SLINGERLAND, (professor of physical science in Hedding College,) Abingdon, Ill., writes:—

"I am a subscriber to your paper and an interested student of your *Problem of Human Life*. I thank you for the telling blows you have struck at false science, and trust you will keep up the destructive fusillade. I have made the study of natural science a specialty for years, but like thousands of others I had accepted the wave-theory of sound as demonstrated, and never questioned the conclusive character of Prof. Tyndall's experiments till I was prompted to do so by you. Within a few weeks past we have, by experiment, proved several of his illustrations to be worthless. I therefore feel that the wave-theory is, both by your arguments and by actual experiment, practically overthrown. And now the question arises, shall we accept your theory? In this let me suggest one thing. Some of us are not yet fully recovered from the blows which so unceremoniously knocked our underpinning away. We scarcely now dare to grasp anything lest we become involved in another downfall. Kindly let us flounder for awhile on our backs, till our senses have fully returned, and then we may be in a condition intelligently to investigate and test your theory of corpuscular emissions, and if it meet the requirements of observed phenomena we will adopt it. Some difficulties that now occur to me will then, perhaps, vanish. If not I will ask your assistance. I send you my picture as

a token of my esteem and even tender friendship, and will be pleased to have yours in return.

Very truly, yours,

W. H. SLINGERLAND."

Dr. A. M. COLLINS, Marion, Iowa, writes:—"The 'Problem' has converted the leading lawyer of this place, who was a staunch evolutionist. He spent last evening with me at my house, and he was in raptures over the 'new light,' as he called it. I am doing all I can to extend the circulation of the work. You will hear from me soon again." [More than fifty cases of a similar kind have been reported to us within the past few months. A tree is known by its fruits.—EDITOR.]

AN OPINION OF THE MICROSCOP.

ing the law of gravitation.

A PUBLISHER of several different papers in

this city was shown a few recent numbers of *The Microscop*, and he once asserted that there must be something fraudulent about it.

He declared that a paper only seven months old, started by an obscure man, as he was in-

formed, and without a dollar's capital to back it, could not possibly call forth such a list of

able contributors from the start, and be filled each month with such an army of original arti-

cles without copying from other journals. He declared that such a journalistic triumph un-

der the circumstances was never known, and he could not believe that the editorials, even,

so varied in scope, were all written by one man. When further informed of the actual

circulation of the paper and of the rate at which new subscriptions were still coming in, his sur-

prise was changed to amazement, and he ex-

claimed: "Well, I thought I had seen all the

phases of modern journalism, but I must con-

fess I have something new to learn."

THE WAVE-THEORY OF SOUND.

We are receiving many requests from Pro-fessors of physical and natural science to con-dense in a series of articles in *The Microscop* our arguments against the wave-theory of sound, and also against evolution and material-ism, as given in the *Problem of Human Life*. We propose to do this, commencing the first of the next volume, and in this manner keep these arguments fresh before the world, strengthened by new facts and new modes of presentation.

Prof. JOHN S. BLACKBURN, principal of Poto-mac Academy at Alexandria, Va., writes:—

"I think it would be an advantage to the cause of scientific truth, and hasten the de-struction of the undulatory theory of sound, if you were to give in the *Microscop* a complete summary of the arguments used against that hypothesis in the *Problem of Human Life*. Owing to the absence of index, and the defect-ive tables of contents, I was compelled to lose considerable time in preparing a lecture on that right angle, or the point nearest his ear. For example: let three unison pitch pipes be blown along this same rail; one at your side, and the others ten feet away, front and back, We expect not only to do as suggested above, but also at our first leisure moment to com-ment the preparation of a complete index to

ANSWER.

"Two persons stand between the rails of a track, say 1000 feet apart. One of them strikes the rail a sharp blow with a hammer, while the other, facing him, listens between the rails. Why does the latter hear the sound in the iron at right angles, and in no other direction? This problem has puzzled the petty philoso-pher of this place and vicinity. Will you oblige your subscribers by answering in *The Microscop*?"

Prof. M. A. RUTENBER, of Sodorus, Ill., pre-sents the following problem:

A SOUND PHENOMENON.

RICHARD H. LEWIS.

Gratefully yours,

Microscop has clinched it.

of conviction into my mind, and your *Literary*. Your *Problem of Human Life* drove the nail destroyed our school-treatises in science, school in America; for you have, in a sense, out new text-books. You owe this to every school, and now wait patiently for you to get have taken science from the curriculum of my falsehood. 'Othello's occupation is gone!' I have also been busily engaged in teaching only not learned the truth in science, but that at this stage of my life I find that I have not was a physician for fourteen years. And now years I have been a teacher. Prior to this I

"WILFORD HALL, Dear Sir:—For seventeen of Kingston Collegiate Institute, N. C., writes:

RICHARD H. LEWIS, A. M., M. D., President

every argument used in the *Problem of Human Life*, to be printed in future editions of the book, and also in some early number of the next volume of *The Microcosm*, for those who have already purchased the "*Problem*."

MICROCOSMIC DEBRIS.

THE secret of the snake charmers of India is said to be sewing up the mouths of their snakes.

Herbert Spencer will visit this country in the autumn.

The shell mounds of Florida are mines of wealth. They contain the richest kind of calcareous mari.

Tombstone, Arizona, is growing so rapidly that they soon expect to be big enough to change its name to Sarcophagus.

Mr. Meredith Read is writing a life of Gibbon. He will scarcely improve on the historian's admirable autobiography.

The ex-Queen of Spain buys a ticket in every lottery of which she hears, repeating the proverb, "Never shut the door against fortune!"

Prof. Huxley is to be invited to fill the chair of Natural History in the University of Edinburgh. It is worth \$10,000 a year.

The German association of spelling reformers has published the first of a series of classical native authors in the new orthography.

St. Paul, Minn., is said to have a fifty-thousand dollar Christian seminary for young ladies. It is to provide unsectarian education of the highest order.

The fact that projectiles weighing 340 kilogrammes (720 pounds) left the Schneider shield at Spezia undamaged, is held to prove its superiority over the English shields.

The number of post cards despatched in Germany during the year 1880 was 123,000,000. In the Post Office Museum at Berlin there are exhibited 418 different kinds of post cards.

Some of the London art studios of to-day are miracles of beauty and taste in marvellous contrast to those simple places in which Reynolds and Gainsborough produced their triumphs.

A north of England paper speaks of a young farmer who "ran rapidly through his property." His property was an open field. He wore a red shirt, and a bull was in the wake of the young farmer.

A dying man startled the people of St. Albans, Vt. by confessing various crimes of which he had never been suspected, ranging from petty larcenies up to a murder; and there is corroborative evidence that he told the truth.

It is proposed to observe the 22d of March at Weimar, the fiftieth anniversary of the death of Goethe. The vault of the Grand Dukes, in which the poet lies, will be opened and wreaths placed on the coffin.

A swarm of bees in Sweetwater Valley, Cal., settled on a rattlesnake six feet long, twelve inches in girth, with twenty-two rattles, and stung it so that it was blinded, and afterwards easily killed with a spade.

Of 980 woman who are this year pursuing the higher courses of education in St. Petersburg, 521 study physics and mathematics, and only 417 literature; 610 are of noble origin, and 774 profess orthodox faith.

Prince Leopold's marriage will be celebrated between April 26 and May 3. Preparations are in progress at Windsor Castle for the reception of a number of visitors, and every corner will be occupied.

British Guiana, which is now without a Governor, would like Sir Anthony Musgrave, present Governor of Jamaica, who married an American wife. The salary is less than he now receives, but the people would be ready to pay a considerable more to secure a really able man.

Some one estimates that if a man lives to be seventy-two years old he passes at least twenty-four of them in sleep. This is a rather low estimate in case the man is a policeman. About ten years more of sleep should be added. If he is an editor ten years should be deducted.

An exhibition of M. Meissonier's works will be held in Paris during the coming spring, at the rooms of the *Societe Des Aquarellistes*, near the Madsleine. The artist will himself superintend the arrangement of the collection, which will be made as complete as possible.

Profs. Church, Emerson, and Woodberry have been dismissed from the faculty of the Nebraska State University because of a row over the question of introducing the discipline and methods of Harvard, where they were educated. They say that Chancellor Fairfield is an old fogey.

It is proposed to celebrate this year at Budapesth the fiftieth anniversary of Kossuth's career as a journalist and a patriot, by presenting him with an album containing the signatures of his admirers. Kossuth is now in his seventy-seventh year.

John Woodcock Graves, the author of the most famous of hunting songs, "John Peel," is living in great distress in Tasmania at the age of 80. He never received a penny from the song. His native county, Cumberland, is raising a subscription for him.

The total number of newspapers and periodicals published in the world in 1880 was, according to the "Newspaper Directory," 34,274 and the circulation amounted to 10,592,000,000, or six copies to each individual living. About 8,000 papers in the Union.

The village of Gothen, in Switzerland, which was built on an ancient moraine, is threatened with destruction. The ground on which it stands is in motion. Several houses have already been engulfed, and the village will probably have to be abandoned.

Recent excavations at Cairo have resulted in the discovery of a monolith belonging to Apries, the Pharaoh Hophra of the Old Testament, inscribed: "The beloved Ptah of Memphis, giving life forever, the good god Ra-aa-ab, lord of the two lands, Apries."

Hardy Solomon before the war was President of a South Carolina bank in which ex-Senator Patterson was a director. Patterson lately came across him in Kansas City, impoverished, but working industriously as a baker, and made him his secretary, at \$6,000 a year.

The brokers, or *agents de change*, at Paris, are limited by law to 60, and each member pays a caution money of \$50,000, while the profits are so large that the seats sell at from \$400,000 to \$500,000. The *agents de change* are said to have made during the past year ten million dollars in commissions.

An exhibition of Belgian art, under the patronage of the Belgian Government, is to be held at Philadelphia, in the Pennsylvania Academy of Fine Arts, during the months of April and May.

The Head colony, in the wheat region of Dakota, is composed entirely of eight brothers named Head and their families, numbering nearly a hundred persons. They have bought 10,000 acres of land in adjoining farms, but these are owned separately, and there is to be no communism in the enterprise.

During last year 300 fewer books were published in Great Britain than 1880. Of theology, sermons, &c., there were 945 works; of novels, 674, educational and philological, 682; juvenile, 500; history and biography, 437; voyages and travels, 201. The total was 5,406, of which 4,110 were new books.

The Lake of Constance is so low that the steamers are compelled to discontinue their calls at several places on its shore. The same is the case with the Lake of Geneva; only once before during the present century, it is said, have the lakes of Switzerland contained so little water as at the present moment.

Washington Irving Bishop, who figured in

this country as an exposé of spiritualism, afterward went to England to perform as a mind reader, after the manner of Brown. He has made some stir there, but has been rather staggered by an offer of a thousand pound bank note if he will ascertain its number while it remains in a sealed envelope.

Bishop Ryle of England says that much of the Christianity of to-day is "jelly-fish religion," of which the basis is, as far as it has any, "no dogma, no distinctive tenet, no positive doctrine." He holds that, both in the Church of England and out of it, there are hundreds of ministers who have not a single bone in their "body of divinity."

The case of the 4 year old boy who became an invalid through inveterate smoking, his parents having given him all the tobacco he wanted, is interesting the faculty of the Surgical Institute in Indianapolis. They have deprived him wholly of the weed, and hope to cure him of spinal trouble which his habit has caused. He had smoked an average of ten cigars a day.

Herr Karl Gehmli of Berne, after a series of experiments extending over several years, has succeeded in producing artificial mother-of-pearl undistinguishable in every respect from the natural article. It can be moulded in any shape, produced in any color, is impervious to heat and cold, and its price will be much less than that of ordinary mother-of-pearl.

Wheat cultivation is the most important agricultural industry in France, occupying as it does about one-fourth of the total cultivated land, and yielding a crop whose annual value exceeds two milliards of francs, or about one-third of the total agricultural production. The total yield has about doubled since 1820. From 1820 to 1864 the yield of wheat in France increased.

The ancient temples of Egypt are believed to contain the oldest timber in the world, in the shape of dowel pins, which are incorporated in stone work known to be not less than 4,000 years old. These dowel pins, according to the appearance they present, are thought to be made from the tamarisk or shittim wood, in ancient times a sacred tree in Egypt.

A rich copper mine has been rediscovered in the vicinity of Tucson, Arizona, within a few weeks. Nearly fifteen years ago it was first found, but the men who located the claim were driven from the mountains by hunger, and neglected to take accurate bearings of the spot. Since then, four or five prolonged attempts to find the rich deposit have failed.

"Mr. Joseph Cook, the well-known American lecturer, has left Bombay," says the *Indian*

Spectator, "without having brought about anything like a religious revolution. This may be a matter for regret, but not for surprise. Mr. Cook attempted the impossible, and failed. Though allowing him to be a very good speaker, Bombay is far from suited with his oratory."

Secretary Russell of the Massachusetts Board of Agriculture said that he should clip his horses, no matter how much any long named society objected. President Angell of the anti-cruelty society of that State replies that he wouldn't prevent clipping if he could, and that his organization has nothing whatever to do with Mr. Bergh or his theories.

The institute of Science and Letters at Milan have decided upon opening an important competition, the object of which is to produce a satisfactory life of Leonardo da Vinci, about whose career so many doubts and discussions arise nowadays. The prize is 5,000 lire (\$1,000), the time allowed to competitors is four years. The work can be written in Latin, French, German or English.

At an anti-Chinese meeting in San Francisco last week, the chairman stated that in the cigar-making business in that city there were engaged 8,500 Chinamen and 179 white men; boot and shoe factories, Chinamen, 150, whites, 37; slipper factories, 49, all Chinese; clothing manufacturers, Chinese, 7,519, whites, 1,000; laundry business, Chinamen, 5,107, and in the express business there are 32 Chinamen.

It having been decided that the Tuilleries ruins are to be cleared away, a commission has been appointed to examine what portions of the same it is practicable to preserve as historical memorials in the national museums or parks. Most of the exposed portions of the stones having been calcined by the fires of the commune, and having since endured the destructive effects of weather, will crumble to pieces at the slightest touch.

It is said that the silk cocoons of California are the finest in the world, but inexperience in reeling the fiber deteriorates the value of the production. In Japan the reeling of the cocoon is so perfectly performed that the Japanese fibre is commonly nine and a half miles long, without a break. The art of reeling is not a difficult one to attain, as it simply requires carefulness and delicacy of handling.

Mr. Holloway, of England, in memory of his deceased wife, has endowed at Engham an institution for the higher education of women. The college buildings are palatial in size. The principal is to be a woman, and qualified female physicians are to reside at the college.

Mr. Holloway has conveyed to the trustees a sum of £400,000. The students are to be allowed to choose their own places of worship.

The dense fog in London recently has caused the deaths of a number of persons. A Coroner's inquest in the case of a wheelwright named James Smith showed that the fog had hastened his death very materially, developing bronchitis to an alarming extent. The fog brought on effusion of the brain in the case of Alice Wright, which caused her death, while the bronchial pneumonia which carried off a little boy named Pepper was ascribed by the attending physician to the poison of the fog.

Potato flour, or the dried pulp of the potato, is attaining considerable importance in the arts—so much so, in fact that in Lancaster, England, some 20,000 tons of it are sold annually, and its market value is stated to be much greater than that of wheat flour. The article is extensively used for sizing and other manufacturing purposes, and, on being precipitated with acid, is converted into starch. After having been calcined it is used with advantage as a dressing for silk.

At Weissdorf, in Lower Franconia, a highly interesting find has just been made. On the slope of the Bugberg, on which probably a castle formerly stood, some children found a gilded iron casket, which had evidently been laid bare by late heavy rains. On being forced open, it was found to contain pearls and stones, a number of rings, and different gold and silver ornaments. There are also a number of gold and silver coins dated 1517, 1612, and 1624.

The breed of Russian horses known as Orloffs are much esteemed in England now as carriage horses. They have clean heads, wide nostrils, and bright eyes, and show high breeding, no doubt an Arabic cross. The horses have more weight than the English, and are mostly dapple grays and blacks. Mr. William C. Winans, the American millionaire, residing at Brighton, bought seven pairs of these horses at great prices, and in the drive from there to London passed all goers.

It is a singular fact that actors, whose habits of life might be supposed to conduce to a different result, are exceptionally long lived. Macklin died at 107, Dowton at 88, Roger Kemble at 82, Macready at 80, Young at 79, Paul Bedford at 78, Buckstone at 77, Marsden at 74, Miss O'Neill at 81, Mrs. Siddons at 76, Mrs. Bracegirdle at 85, Mrs. Abington at 78. Of those still living Webster is 84, Mrs. Keeley 76, and our own John Gilbert is blith and gay at 72.

Rosa Bonheur is engaged in painting a series of heads of animals which are to be reproduced.

by an English engraver. One of these, "An Old Monarch," the head of a splendid old lion, was published some months ago; it has now been followed by "An Humble Servant," the head of a demure-looking donkey. The method employed is that mixed style in which most of Landseer's works were engraved. This method is peculiarly fitted for the expression of the various textures which come together in an animal picture.

A paper has been discovered in the archives of Venezuela, dated 1780, which gives an historical summary of early projects for piercing the Isthmus of Panama. The first goes back to the reign of Philip II. of Spain, who, at the instigation of the Viceroy of the Indies, sent certain Flemish engineers to investigate on the spot the feasibility of the undertaking. Their report was altogether adverse, and there upon Philip II. threatened the penalty of death against whoever should again bring up the project.

Emigration to Cape Colony from Great Britain is fast increasing. For 1879 the returns show only 1,332 emigrants; for 1880 the number was 2,607; for 1881 it was 4,163. These 4,163 consisted of 324 men for the Government railways, 2,613 artisans and domestic servants, 758 agriculturists, and 468 recruits for the Cape Mounted Riflemen. The agriculturists took out with them in money alone an aggregate of \$77,325, or a little over \$100 for each man, woman, or child.

M. Gambetta's intimates whisper that his mental condition is anything but satisfactory. He alternates between fits of anger and fits of despondency, which bode no good to his general health. He was indiscreet enough to say to a stranger, "The Deputies are my masters, but universal suffrage is their master, and I am the master of universal suffrage." He countermanded a reception in a pet; and, on the other hand, rendered himself ridiculous by embracing the orchestra leader Sellenick, who had dedicated a march to him, and played it in his presence.

A Massachusetts State officer is about to undertake the enforcement of the law regarding juvenile labor. It provides that no person under eighteen shall work more than ten hours a day in a manufacturing establishment, except in certain specified emergencies; that children between eight and fourteen shall attend some public day school at least twenty weeks in each year; none under ten may work at all in a factory, and none under fourteen unless able to read and write. The law has been practically disregarded.

An ex-professor of mathematics in a Russian

university, who escaped from Siberia a few months since, says that to be an exile in Siberia, under certain circumstances, escape offers no great difficulty. It is more an affair of money than anything else, the distance being so great and the population so sparse that very close police surveillance is impossible; but escape from penal servitude is a terrible undertaking, and is very rarely accomplished. Sophia Bernina, who recently found her way into Switzerland, is the only woman that has yet performed the feat.

French women of the upper classes are getting quite famous as successful stock jobbers. One countess, well known in society, has retrieved her family fortunes in a marvellously short time. The substance of her race had been wasted in riotous living, when this lady, who is a woman of remarkable beauty, speculated in stocks until she gained sufficient money to buy back the chateau, to furnish it *en princesse*, to fill the stables with horses and to indulge in a profusion of natural flowers, which is a luxury very dear to the heart of every Parisian woman.

The extraordinary spectacle is to be presented in the Diocese of Minnesota of two women as lay readers in the Protestant Episcopal Church. Bishop Whipple has declared his intention of licensing them because men are not to be had. Lay readers in the Episcopal Church have not the functions of the clergy, but are simply licensed by the Bishop to read the service and such sermons as he may put into their hands for the purpose. Lay readers do not generally wear the gown; but in this respect these good sisters are already equipped.

At a recent funeral in Iowa a parrot which belonged to the deceased and had been taught to repeat passages from Shakespeare, repeated during an impressive pause in the service the words "To be or not to be" in such a manner as to cause a peculiar impression upon the assemblage.

In 1880 France took from Italy 40,000,000 gallons of wines, being more than four-fifths of Italy's total wine export. The quantity of wine thus taken from Italy in 1880 by France is not very far under her own total exports of 1881. The French wine merchants naturally send their cheaper falsified wines abroad if they can, being afraid of the more experienced palates of their countrymen; and the Italians do not scruple to assert that there is not a cheap claret now drunk in England that is not mainly composed of Spanish and Italian wines, blended, if not adulterated.

Many music boxes are sent to China. John is so fond of them that at festivals he goes

about with two or three in his pockets. He will have nothing else. A music box can be concealed in a very small compass, and the instruments are put into any imaginable article—cigar stands, snuff boxes, chairs, dolls, clocks, boot heels, decanters, fans, &c. One gentleman has an attachment to his front door, and his visitors are always greeted with a tune. Nearly all of the boxes are made in St. Croix or Geneva, Switzerland. The tunes must be adapted to the various countries to which they are exported.

Two sides to it.—“There are two sides to everything,” said the lecturer; “I repeat it, there are two sides—” At this juncture a tired-looking little man stood up in the front seat to say—“Well, if you’ve no objections, I will just step out and see if there are two sides to this hall. I know there is an inside, and if I find there is an outside you’ll know it by my not coming back. You needn’t be alarmed if I shouldn’t return.” And as he walked up the aisle he was followed by the admiring eyes of the whole audience. Their sympathies were with him, but they were deficient in moral courage.

Italian scholastic statistics for the year 1880–81, show that the total number of students attending the seventeen Government universities during that year was 11,141. The largest number attending any single university was 3,000 at Naples. The universities next in order as regards attendance were Turin, Padua, Rome, and Pavia. The four free universities numbered only 256 students, while the superior institutes and schools of applied science were attended by 1,261. The total number of Italian youths, therefore, receiving superior instructions in 1880–81 was 12,000, which is said to be an increase of 969 over the previous year.

The contest of the native with foreign merchants for the control of the Japanese silk market continues. The native direct exports to agents in England, France, and America have very largely increased, and matters begin to look very serious for the foreigners, who are so boycotted by the Ring that their business is completely paralysed. They will have to look forward to a time, not far distant if capital lasts, when the Japanese, and Chinese too, will themselves send the greater part of their exports to fellow countrymen or agents in other lands. The rapidly increasing knowledge of English among the Japanese is helping them immensely in these undertakings.

What most astonishes those who visit the boring of the British Channel Tunnel is, first, the complete dryness of the rock, and, secondly, the marvellous ventilation of the long and

narrow tunnel (it is only seven feet in diameter), which extends now 1,100 yards under the sea, and which, it is promised, will by Easter be fully a mile long. The air at the head of the boring is far purer and pleasanter to breathe than the air of any London street, and the reason is obvious. It is, in fact, the very healthiest sea breeze, caught just below Shakespeare’s Cliff, and, after compression, conducted thence in a five-inch pipe to the boring machine 1,100 yards off; there the air escapes in the most inoffensive and even agreeable manner.

Claremont, the future home of Prince Leopold, was the residence of the Duke of Newcastle, the Minister of George II. It was purchased by the country early in the present century, when it was made over to Princess Charlotte and her husband. On the death of King Leopold, an act of Parliament was passed assigning it to the Queen for her life; so that, practically, it is lent to her Majesty by the country, and at her death it will revert to the public. The Queen has expressed a wish to purchase the reversion of the place, a transaction to which nobody could object, as it would be easy to ascertain its value subject to her life interest. If this project be carried out, Claremont will, of course, become the Queen’s private property, like Osborne and Balmoral.

The Rev. Mr. Duff, rector of St. Peter’s Church, Helena, Montana, speaks of Montana as one of the most remarkable of all missionary fields. He says that one Bishop and seven clergymen have to work over 145,000 square miles of territory. These devoted laborers know nothing of the comfort of city parishes with fat salaries. They have to ride on long journeys, with the thermometer at from ten to twenty degrees below zero. The Bishop last summer set out from Helena to visit as much of the diocese as he could reach. He was gone four months, and travelled 3,000 miles, mostly on horseback. He is said to be doing the work of three or four clergymen. There is urgent need of more clergymen in Montana; but in order to pay them, money is the prime necessity.

Sir Joseph Hooker’s recently issued report on Kew Gardens contains an interesting note on the subject of the cola nut. They are the seeds of a tree, *Cola acuminata*. From six to twelve are contained in woody pods, from three inches to six inches in length, of which five or less are produced by each flower. They enhance the flavor of whatever is eaten after them, but their most important property is that they have the power of staying, even for a prolonged period, the cravings of hunger,

and of enabling those who eat them to endure prolonged labor without fatigue. The trade in cola nuts is an attractive feature in the commerce of the Gambia. They are the product of the Sierra Leone district, and the trade in them, both at Sierra Leone and the Gambia, is almost exclusively in the hands of women, to a large number of whom it affords the means of livelihood, and in many instances the acquisition of considerable wealth.

THE CHRISTIAN STANDARD.

THE scientific (!) editor of the above-named paper has evidently not yet recovered from the quiet little lashing he received in the October *Microcosm*, on the decrease of sound intensity. He undertook to criticise us, and then in the next number of his paper he took it all back and confessed that he did not know what he was talking about. We simply agreed with him in our reply, and he has been riled with us ever since, for he has learned, no doubt, that the only effect of his pseudo scientific criticisms has been to amuse the readers of the *Standard* at his unsophisticated innocence. He thinks we ought not to hold out "baits" to induce criticism and then publicly "spear" the shy fish that come to the surface to nibble. He even says in his evident irritation that we stated what we "*knew to be false*" about a body weighing four times as much one foot from the ground as at two feet! So did Elijah state to the prophets of Baal what he knew to be false, when he said to them: "cry aloud; for he is a god: either he is talking, or he is pursuing, or he is in a journey," &c.—1 Kings, 18: 27. But he did not think that those false teachers were such fools as to believe him in earnest! In like manner we really thought that the scientific editor of the *Standard* would see the point of our remarks, but he didn't. He now talks about paying attention to our March article on Newton and Gravitation, as soon as he gets time. He had better not, if he does not wish to put his scientific foot in it again, and then have to take it all back in the next number of the *Standard*. He had better hold out a "dummy" for the fire of *The Microcosm* than thus to expose his diminutive head, for he will have use for it and for one of twice the caliber if he attempts to dabble much in matters of physical science.

But seriously, is it possible that the old *Christian Standard* is becoming jealous of the success of the little *Microcosm* in its eighth month? Why should it, since their fields are entirely different? If not, then why this gratuitous and bitter attempt to prove the editor a *liar* in

a matter upon which no fair-minded or intelligent man would have thought of venturing a serious remark? Brother Errett will have to put a curb upon the erratic genius who takes charge of his scientific department, unless he wishes to bring his high-toned paper into bad odor with its readers, thousands of whom also read *The Microcosm*. Personal abuse of another editor, especially to gratify an old pique, is not the healthiest thing in the world for a religious journal to indulge in.

NON ETERNITY OF ALL THINGS SAVE ONE.

BY REV. T. WILLISTON.

AT this late day, an argument in proof of the acknowledged truth that all things, save One, have had a beginning, may seem to be quite superfluous. We moderns smile as we learn what fanciful theories respecting the world's origin some so-called philosophers once held and taught. When we learn, for example, that in the opinion of some the world as we now see it has existed from eternity; of others, that the material universe is a body of which God is the soul, or an emanation from the Deity, and not his workmanship; of others, that both God and matter are without a beginning, and that the latter, after long existing in a chaotic state, came at length, unaided by God, to be an organized world; and of still others, that all things came to have their present form through the accidental collision and adhesion of countless uncreated atoms that had for ages been moving at random in the voids of space, and had formed various other combinations before becoming the world that now is: when, I say, we learn that some of the wisest men of ancient Greece entertained such absurd views as these, we smile at their ignorance, and felicitate ourselves in view of our superior knowledge. Yet it is but a few years since I conversed with a man who thought we have no convincing proof that there is a God, or that the world has not, as once taught by some, existed from eternity. And here are the words that were uttered a few years ago by an eminent scientist, in describing the Darwinian theory of Natural Evolution: "What are the core and essence of this hypothesis? Strip it naked, and you stand face to face with the notion, that not alone the more ignoble forms of animalcular or animal life, not alone the nobler forms of the horse and lion, not alone the wonderful and exquisite mechanism of the human body, but that the human mind itself—emotion, intellect, will, and all their phenomena, were

once latent in a fiery cloud! * * * I discern *in matter* the promise and potency of every form and quality of life." Since, then, there is here and there one, even in our day, that thinks the world *may* have had no beginning, or that matter may possess a sort of independent and creative energy, and since there are some that deem Reason a surer guide than the Bible, let us lay the Bible aside, and see what Reason has to say respecting the points in question.

Were I reasoning with a believer in the eternity of the world, I would have a short chain suspended from the ceiling of the room we occupied, and then I would address him as follows: "By means of this pendant chain let me convince you, my brother, that all existing things have had a beginning, save One. You see at a glance that each link of this chain is dependent, proximately, on the next higher link, and that the uppermost link, and indeed the whole chain, is supported by an immovable something that differs essentially from the chain. You see, too, that while new links could be appended to the chain's lower end, the adding of never so many to its upper end would do nothing toward rendering the chain an *endless* one. Lengthen it upward never so much, yet the chain would always have a first link, and would always need to be upheld by that firm supporter overhead. Now observe, sir, what a striking and beautiful analogy there is between this pendant chain, with its many links, and the successive generations of men, brutes, and all vegetable growths. Beginning with the lowermost links of this vast chain—and they are in full view—we can trace the series upward, link after link, till we reach the first human pair, the first animals, the first products of the vegetable kingdom. And it is quite obvious that were the series extended back through millions of ages instead of a few thousand years, the chain would still have a beginning, and would still have to hang on something that was stable, and wholly unlike what it upheld. Could a pendant chain ever be made so long as to have no upper end? You see, dear sir, that no Bible is needed to disprove Ocellus Lucanus' theory of the world's eternity, for Reason alone demonstrates its absurdity. You cannot help confessing that dependence and mutability are stamped upon all earthly things, and is it not self-evident that whatever is mutable and dependent must have a beginning, and must derive its origin and support from something that is not mutable and not dependent? If this be admitted, nothing more is needed to prove that even matter must have had a beginning, for inert, unorganized matter is obviously a very mutable

and dependent thing. But if further proof of the non-eternity of matter is desired, we will for a moment change sides, and unite with Plato and other ancient thinkers in affirming that matter, as well as God, has existed from eternity. Matter, then, being confessedly just as old as God, was never in the least dependent on Him, but was like Him, uncaused or self-existent, and of course it was, like Him, independent and almighty! Nothing can be more certain than that *a power to exist without beginning is an almighty power, and renders its possessor, whether matter or God absolutely and forever independent.* Would God have been the independent and almighty Being that He is, if He had not existed without beginning? Now if His existing from eternity is the very thing that renders Him independent and almighty, it follows that if matter has *always* existed, it also is independent and almighty. Moreover, if matter has some of the same *natural* attributes that God has, how know we but that matter thinks, and has the same intellectual and moral attributes with Jehovah! In short, if matter be the self-existent and eternal thing that some have believed it to be, how know we but that "emotion, intellect, will, with all their phenomena, were once latent in a fiery cloud?" and why ought not ever-existing Matter to be revered as truly as the ever-existing God?

I trust, dear sir, that you are fully convinced of the non-eternity of the world, and of matter also. And as this pendent chain has taught us that our world, with its numerous generations of plants, trees, animals and men, has had a beginning, it has also taught us that there must of necessity be one Being that has had no beginning. It is just as obvious that there could be no universe of dependent things without an ever-existing God to create and uphold it, as it is that this chain neither forged itself, nor upholds itself, but is upheld by that staple in the overhanging wall. And we see convincingly that Reason demonstrates some of the very truths that the Bible merely affirms, or takes for granted.

And now since there is overwhelming evidence that the uncreated One on whom we are wholly dependent is a Moral Governor, a Being of infinite excellence who is to be our Judge, be it ours, my dear brother, to render Him that adoration, obedience and love which are His rightful due. Till we meet at his bar, adieu.

THOUGHT AND FORCE.

BY PROF. I. L. KEPHART, A. M.

ATHEISTS are wont to attribute much to "the forces of Nature." With them these are suffi-

cient to account for the present form and condition of all material existences, man included. The magical force which they are pleased to denominate "Spontaneous Generation," has brought into being the universe, and established, and even now executes the laws that govern and sustain all its multifarious activities.

But does not the existence of Force predicate the pre-existence of Thought? or in other words, is there primarily any force but thought? Are not all the activities of human production traceable for their origin to thought? and this being so, does it not amount to a very strong presumption that the same is true of all superhuman activities? For example :

On a clear summer's evening a traveler, seated in the middle coach of a train of nine cars finds himself conveyed up the eastern slope of the Alleghanies west of Altoona, Pa., at the rate of thirty miles an hour. As the train rounds the great "horse-shoe bend," he looks out to his right and sees the two mighty locomotives puffing their way up the wonderful grade eastward. He turns and looks back to his left and sees the rear coach of the train sweeping over the track westward. Overawed at the remarkable evidence of engineering skill and human industry, the thought occurs to him, how is it that I can now ascend this mountain around this wonderful curve, seated thus comfortably, at the rate of thirty miles an hour? Forty years ago this was not so.

Thought after thought chase each other through his brain in quick succession, and soon the irresistible conclusion is reached, "*This road is all the result of thought.*" Thought conceived the necessity for such a road; thought conceived the utility of such a road; thought drew the plan for this road; thought, energizing and controlling muscular action, surveyed, located, built, equipped and operates this road: and even now, thought co-ordinating in the brain of the trusty engineer, controls the throttle-valve and the air brakes, and thus secures the onward movement and safety of this train. So our rushing up the Alleghanies at the rate of thirty miles per hour is all the result of thought.

But what is thought? Simply the mental, *immaterial* activity of a thinker. The existence of thought declares the existence of a thinker; and the existence of a material structure which is the result of and is now kept in operation by thought, demonstrates the existence of a thinker.

Whilst thus musing, the train thunders through the tunnel and commences to descend the western slope. The traveler then looks out

to the northwest and sees the beautiful evening star Venus, and immediately his mind is off to the planetary system and away among the fixed stars. He thinks of those mighty orbs sweeping through space with the velocity of lightning, of the unerring precision with which they complete their cycles, enabling the astronomer to determine by actual mathematical calculations the day, the hour, aye, the very minute when eclipses of the sun and moon will occur for thousands of years to come. He considers the wonderful good to man resulting from the regularity of their motions and the change of seasons, and remembers that while railroad accidents, in spite of all possible care, are frequent, no planet in its motions has ever been behind time or collided with another, and he asks himself the question: If the thundering of this train across the mountains is all the result of original and continuous thought, can the whirling of these stupendous orbs through trackless ether be the result of chance? If a first-class railway in operation proves the existence of *men* who think, surely

"The unwearied sun. * * * *

"The moon * * * * *

"* * * the stars that round her burn

"And all the planets in their turn,"

most unmistakably declare

"The hand that made us is divine."

Their existence and movements proclaim omniscient *thought*, and thereby demonstrate the existence of an omnipotent *Thinker*.

Take another example: A visitor to the Centennial Exposition at Philadelphia, enters Machinery Hall. His eyes are at once held spell-bound by a vast sea of whirling machinery; spindles spinning, looms weaving, printing presses printing, and nearly every conceivable kind of machinery in motion, each turning out its appropriate article finished and complete. He asks himself, why do these wheels whirl, these looms weave?—What power gives motion to all these works of human art? for he does not for a moment absurdly conclude that all this is the work of chance—that these machines have the inherent power of self-motion. No; he begins to look around for the motor, and presently he stands before the great Corliss engine; he hears its mighty throb; he witnesses the revolutions of the mighty balance-wheel, executed without the variation of a hair's-breadth.

He asks himself, is the power in that wheel? and the answer is, no; that wheel is but inert matter. He looks at the boiler and asks, is the power in the steam? and again is answered, no; not necessarily so, for steam, without the necessary appliances, does not produce such re-

sults. Is the power in the fire? No; fire is only the rapid union of oxygen and carbon producing carbonic acid, and fire does not always produce such results as these. But wherein consists the power? Why does this engine puff, this machinery whirl and produce these wonderful fabrics? The answer comes; *The cause is thought.* Thought in the brain of Watt conceived a plan by which to utilize steam; thought constructed the mighty engine; thought arranged the machinery; thought superintends it now; and the thoughts of active vigorous thinkers have produced all these wonderful results. Motionless, lifeless matter is but a tool in the hands of living, acting thought.

Let us now turn to Nature and contemplate her vast and manifest activities. What wonderful skill, what tremendous power is evinced in her silent yet ceaseless and awe-inspiring functions! Who can intelligently contemplate all these without seeing in them overwhelming proofs of the existence of an infinite thinker? Every atom is precisely suited to its purpose; and everything is, withal, so beautiful and grand, that never poet lived but failed to rightly sing its praise, and to portray its loveliness.

Surely in a world "spontaneously generative," if that were possible, the most sanguine atheist would be certain to discover discord and chaotic medleys of useless matter: but the Christian can boldly rise, fling the gauntlet at the feet of all the learned infidels of past and present times, and exclaim, "*Go find confusion or a fruitless thing in all this world.*"

The most acute and profound thought of men was necessary to bring into existence and perfect the operations and sustain the activities of Machinery Hall. But did accident establish the universe? The most careful superintendence is necessary to the perfect operation of a railroad. Does blind, unthinking chance keep in motion the lives and activities of a world? The careful serving of an apprenticeship by a *thinker* is necessary to enable a man to build an engine. Was the universe built without thought? An artificer takes a few bits of material and constructs a beautiful watch and we admire the work and the workman, giving the latter credit for both intelligence and skill; but we drop a seed into a little earth, and in due time, by the aid of sunshine and moisture, we have a full-blown and most beautiful rose, and we call this the natural result of a blind law enacted and executed by a blinder chance!

But in material creation we have only the minor manifestations of God. Look at that crowning work of creation—*mind*. Gaze

through the countless chambers of the soul. Here we reach the grand consummation of creative skill; and here in this holy of holies let us reverently pause and see if all the cycles of eternity and all the void and fathomless ocean of infinity placed in the hands of chance could, by all the correlations and evolutions of possibility, have shaped from nothing or generated from lifeless matter, such a master-piece as mind. Has chance or a blind law instilled the human heart with the celestial harmony of love? or the boundless revelry of imagination? Have all the unnumbered faculties of the soul been compounded by a blind and thoughtless accident? No, no! Just as the observer was brought to the irresistible conclusion that the original, producing, and sustaining cause of the structures and activities of Machinery Hall was finite *thought*, so does an intelligent comprehension of the structures and activities of creation satisfy the unbiased mind that its producing cause and sustaining force is nothing less than the infinite thought of an infinite *Thinker*. And as an intelligent survey of the machines there on exhibition could not fail to lead to the conclusion that they were invented for man's benefit, so an intelligent and unbiased comprehension of the phenomena of a Nature must lead to the conclusion that the paramount purpose of the Creator is the greatest possible good to His creatures.

THE INNER MAN.

SALTILLO, Miss., Feb. 13, 1882.

A. WILFORD HALL:

In looking over the *First Book* of that grand poem, "YESTERDAY, TO-DAY AND FOREVER," in which book the author describes "*The Seer's Death and Descent into Hades*," I was struck with a passage in which he vividly presents the same view of the "inner man" which you maintain with so much strength in the "*Problem of Human Life*." I transcribe the passage, italicizing some of the lines to which I would invite special attention; and ask for it a place in the *Microcosm*.

B. F. MANIRE.

"They err who tell us that the spirit unclothed,
And from its mortal tabernacle loosed,
Has neither lineament of countenance,
Nor limit of ethereal mould, nor form
Of spiritual substance. The Eternal Word,
Before He hung upon the Virgin's breasts,
Was wont to manifest Himself to men,
In visible similitude defined;
And, when on Calvary He gave up the ghost,
In that emancipated Spirit went forth,
And preached glad tidings to the souls below.
The angels are but spirits, a flame of fire,
And subtle as the viewless winds of heaven;
Yet are they each to the other visible,
And beautiful with those original forms

That crowned the morn of their nativity.
 Each has his several beauty. It is true
 The changes that diversify their state,
 Wrought with the speed of wishes at their will
 And pleasure who are pleased as pleases God,
 And many as are the leaves and bloom and fruit
 That shed new lustre on the orange groves
 And vineyards of the south; *but still remains*
Their angel ideality the same,
 As we confuse not orange trees and vines
 And so the spirit inbreathed in human flesh,
 By death divested of its mortal robes,
Retains its individual character,
As, and the very mould of its sojourn
 Within this earthly tabernacle. *Face*
Answers to face, and limb to limb; nor lacks
The saint immediate investiture
With saintly apparel. Only then the mind
 Which struggles here beneath this fleshly veil,
 As the pure fire in a half polished gem—
 Ruby, or amethyst, or diamond—
 Imprisoned, when the veil is rent in twain,
 Beams as with solar radiance forth, and sheds
 Its glow o'er every motion, every look;
 'That which is born of spirit is spirit, and seems
 All ear, all eye, all feeling, and all heart;—
 A crystal shrine of life." —Book I: Lines 406-446.

THE BIBLE OR SKEPTICISM.

BY REV. J. J. SMITH, D. D.

MODERN Skepticism has certainly put on a boldness, in its infidel and atheistic madness, that is out of all proportion to the plausibility of its baseless cosmoplastic theory, and its visionary speculations on the processes of evolution. It is truly wonderful to see how it jumps at conclusions, in many instances, in order to reach certain ends. In its arrogant assumptions it claims that the Bible and the faith of the Christian world in its inspiration are nothing; and that *science* and the shadowy dreams of skeptical scientists as set forth in Darwin's theory of the origin of the species, Lyell's Antiquity of Man, Haeckel's History of Creation, and Huxley's lectures on evolution, are everything. It not only in the most flip-pant manner dismisses the evidence of a Divine Revelation as unworthy of serious consideration, and also utterly ignoring as important factors in its estimation of the *Word of Life*, the manifest forces of godliness which it has created and promoted among all classes who have received and obeyed its teachings; but it has in many instances become grossly and shockingly profane in its attempts to cast odium and ridicule on the Christian Religion. A writer of this stamp not long since sneeringly and contemptuously designated the "Man of Sorrows" as the "the trade mark of the new theology;" and the early Christians as "Hebrew fanatics," and "Miracle mongers," and "whining hypocrites."

These are the kind of men who are aspiring

to leadership in thought respecting the spiritual as well as the physical, and who would have us give up the Bible with its sublime teachings of a great intelligent First Cause of all things outside of himself. To give up forever the idea of a Creator and Governor of the Universe; to believe with them that matter is not only eternal, but that all organization, life, instinct and thought, originated in and came from this inert lifeless substance, and that it only chanced to take on these various organic forms. That away back at some unknown point of time, at the very commencement of the remote nebulous primordial period somehow or other (but no one can tell how, or when, or why,) the unity, or attraction, or cohesion, or something else of its inherent properties that had slept most profoundly for untold millions and millions of ages before, now began most strangely and unaccountably to awaken, as though they had been suddenly vitalized with some new element of power. The atoms now began to stir, to move, to dance, and to whirl. Vapors began to condense, and gyrate, and in this way worlds were evolved.

All this, however, was as nothing to the marvelous changes and transformations which followed. Not only a world of untold organic beauty, life, and variety was developed in the vegetable domain, on plains, hills and mountains; but multitudinous forms of a still higher life throughout the wide range of the animal kingdom, were also evolved, embracing an almost endless variety of size, form, color, habit, and nature; with their wonderful adaptations to their surrounding conditions, mode of life, and their astonishing instincts. And, furthermore, that mere matter working through chemical repulsions and affinities, or some other incomprehensible mechanical law or laws, has in its mysterious processes changed wrens into eagles, doves into hawks, pigeons into buzzards, canaries into crows, sparrows into geese, humming-birds into ostriches, hares into hyenas, sheep into tigers, hogs into lions, mice into elephants, cats into camels, toads into horses, bugs into monkeys, and so on; and that in this way, the human race itself has been by this inexplicable process, evolved from polly-wogs and lizards.

Now, can any one imagine a more improbable, unreasonable, or absurd theory, than the above. How was the first monad or moneron vitalized with life? It will not do to say that life was the result of electric action. Electricity is only matter, and as it has no life of itself, it could never have imparted it to other matter, as neither that nor any other substance can possibly give what it does not itself possess. Besides, neither chemical nor mechanical action

tends to produce life. As no stream can of itself rise higher than its fountain, so no effect can in any case exceed its cause. There is just the same creative power necessary to get the animalcula started, organized, and vitalized, as is required to create a more perfect being. Besides, this is by no means the only or chief difficulty that this theory has to face. From whence has come the wonderful instincts of animal tribes that meet us on every hand? Or, from whence came the still more marvelous elements and attributes of man, such as thought, intelligence, reason, conscience, and his untold possibilities? Could mere matter generate these vital forces so high above it, and so superior to it? The idea is absurd. Then, how comes it that there is everywhere in Nature such unmistakable manifestations of design, intelligence, contrivance, and the most consummate wisdom? Could blind, unintelligent matter that is far down the scale below even a toad, have done this? Surely skeptics must be severely pushed indeed, to feel themselves compelled to adopt the ridiculous and godless theory of Haeckel and Huxley. Where is the Christian scholar who would not hang his head in shame, if he were compelled to resort to such groundless assumptions, such visionary speculations, and fanciful postulates, in support of the prophecies, miracles, and teachings of a Revelation?

And all this nonsensical jargon of absurdities, which have been formulated for the purpose of dethroning Jehovah, and proving the Christian Religion to have been founded in ignorance and superstition, these skeptics would have us receive in place of the sublime, intelligent, and soul-inspiring record of Moses. Could any one conceive of anything more supremely ridiculous than it would be to give up the Bible account of creation, in order to embrace such vagaries, and manifest inconsistencies as are involved in the unscientific theory of evolution? What! give up the Bible with its thrilling truths, its holy precepts, its glorious promises, its vast sweep of prophecies, and its grand and lofty disclosures of eternity? This Sacred Book which constitutes the very foundation of the great Christian fabric of ethics and all true morality; and which has so wondrously advanced and blessed all Christian nations; which has elevated our race wherever its light has come, purified the very fountains of society that were wont to carry pollution and death in all their streams, and pour unnumbered benedictions upon fallen humanity everywhere? Give up the only Book that intelligently and authoritatively tells us of the origin and primordial condition of our globe; or the creation of all things; that alone unfolds

man's nature, relations, obligations, and duties to his Maker, and his fellow beings; of the moral government of God, the immortality of the soul, the duality and nature of the future state, the resurrection of the dead, and a general judgment? Give up the Word of God with all its grand and glorious truths all radiant with Divine illuminations, for the protozoan vagaries, and shadowy dreams, and random guesses of infidels and scoffers? No! never! It would be a thousand times better to give up a palace for a wigwam and that wigwam on fire, or to give up a staunch, able steamer for a single plank in mid-ocean, and that in a hurricane, than it would be to give up the Bible for the visionary speculations of skeptics. To discard this Blessed Book, would be to go back to paganism, to destroy the very foundation of our Christian hopes beyond the grave, and thereby to plunge millions of believers into perplexity, darkness, and despair.

GOSPEL OF DIRT, No. 2.

BY COL. JNO. M. PATTON.

In a former article I gave three evidences from the quondam friends of modern materialism, of what I called its suicidal asphyxia. I now add, under a fourth and fifth head, other evidences that it richly deserves its rapidly approaching downfall.

4th.—The system which is thus condemned by those who were its sometime advocates, is utterly repudiated by many of the ablest scientists of the world. For example, Dr. J. W. Dawson, L. L. D., F. R. S., F. G. S., principal of McGill University and author of "Archia," "Acadian Geology," etc., thus speaks of it. After referring to Cuvier as possessing one of the "greatest minds ever devoted to the study of natural science," and rejoicing that his intellect had not been "occupied by the *evolutionist metaphysics* which pass for natural science with too many in our day," he says: "It is reason for profound thankfulness that it was not so; and also that so many great observers and thinkers of our day, like Sedgwick, Murchison, Lyell, Owen, Dana and Agassiz have been allowed to work out their researches almost to completion before the advent of those *poisoned streams* and *mephitic vapors* which threaten the intellectual obscuration of those who should be their successors." (The theory of the Earth and Man, 1874, pp. 249—50.)

5th.—At the Sheffield meeting of the British Association, already referred to, the eminent scientists, Professor Houghton, of Trinity College, Dublin, is reported as using the following language: "Any Darwinites present will

excuse me if I use strong language. We have been thoroughly nauseated with Darwinism; in fact, we have had enough of it * * * * I congratulate not only the association, but the men of Sheffield, that you may now think and feel with men of science, that poor creatures like Plato and Aristotle and Newton were not wrong in thinking that there was something inside of them which differentiated them from an ox or an ass. We have now come round, and we can say to the world around us, "Don't be afraid of the convictions you learnt from your mother, and the belief you were brought up in. Don't be afraid!"

So ends, if Virchow, Tyndall, Allman, Darwin, Houghton, and Wilford be right, the last and most formidable presentation, in these last days, of that doctrine of materialism—born of evolution—which has brought the night of loneliness and despair not only to *Physicus* and *Clifford*, but to many thousands of as pure and earnest souls. The walls of this modern Jericho are crumbling, and above and beyond the roar of their approaching fall we shall hear the soft, sweet, eternal anthem more clearly and distinctly than ever. "In the beginning God created the heaven and the earth * * * * The Lord God omnipotent reigneth, and He shall show the 'old faith' to be also the ever 'new faith' by redeeming and perfecting His creation."

The Christian is the *true* evolutionist. But he does not start from a blind molecular; he starts from the perfected creation of God marred by the fall of man till the "promise and potency" of life in him was as little, in the natural way, as in matter. He looks for an evolution of the fallen man from that low standpoint (through the grace of God in Christ Jesus) into the perfect man whom the ordinary evolutionist longs for. Men stagger, especially scientists, at the idea, that man fell from a perfect state, that God cursed the ground for his sake, and that the earth brought forth thorns and thistles on account of his sin. But why should they do so? Take the perfect, unfallen man as he came forth from the hand of God; or take the perfect man to whom the Darwinian looks forward as the glorious full-blown flower of the evolution process, and place him in this world, the first and father of our race. Let him, and his blessed generations live here, not for geologic periods, but for the poor six thousand years, which the most zealous chronologist would allow. Can we doubt that the thorns and thistles and noxious things of earth would soon disappear before their exalted and perfected powers, all directed to the highest good of man? Nay, can we doubt that wars, pestilences and famines would long since have

ceased, and that even the terrible powers of Nature that manifest themselves in earthquakes and tornadoes, would have been turned into ministers of man's majestic will? Need we point to Maury's charts, to the mastery of light, heat, and electricity, and of the thousand other stupendous forces of Nature as evidences that even what the evolutionist calls the imperfectly developed man of this day can modify or render useful to himself the operations of Nature almost unendingly! And yet these things are but a tittle of what the perfectly restored man will hereafter do, the evolutionist himself being witness. We may well believe, nay, we well know that no thorn or thistle, or other thing which could injure or mar a perfect world, would be suffered to remain here by the perfect man, whether he were *created* or *evolved*. It is true, then, in a strict, if not a literal sense, that *if* man fell, the ground was cursed for his sake, or, which is the same thing, by reason of his fall—or at least his fault—for, alas! thorns and thistles and noxious things *do* abound here.

In the ocean of human thought there is a huge, dark, and dismal island named materialistic "Evolution." Within its brooding gloom shine no supernal lights of sun, or moon, or stars, but fogs, and mists, and clouds enfold it in a cold and black embrace, lit only by the lurid fires that blaze upward from abysses of the earth. No "Mounts of Ascension" into purer air are there; its loftiest heights lead only into deeper darknesses. Oh God! how many brave, strong ships have gone down upon its relentless breakers! Men and angels may well have wept over the piteous scenes of which it has been the theater. *At last*, however, we may rejoice to believe that this godless, soulless island may yet be redeemed. Already lighthouses have appeared along its shores. Dawson's, Houghton's and many others; and even the fogbells of Virchow, Tyndall, Allman, and more besides, have begun to chime sweetly along its frowning bluffs and headlands, above the roar of its awful surf. Nay, more, the good ship "*Problem*" has found safe anchorage along its inhospitable shores, and its electric lights shine out from masts and yards far into the dark interior; alluring, even now, some of its unhappy people. Can we repress the hope that some blessed day its clouds and darknesses will be dispersed, and that the rays of the *Son of Righteousness* will chase the shadows from its highest summits and its deepest valleys? "Watchman, what of the night?"—Lo! the morning dawns, and the night hastens away! Let us hope that we shall yet hear even from that dark scene, in unison with all Christendom, the interser song, "*The Lord*

had gone but a moment, when I happened upon them. I called her back. Said I, "If you do not believe me, listen to this, and this, and this," reading notice after notice.

Completely aroused by the discovery I had made, and encouraged to further exploration by the concurrent testimony of my own judgment and that of so many others, I settled myself for a careful reading and consideration of the work. I am not very emotional or very demonstrative in my feelings, but I confess, as I drank in the mighty argument, I scarcely knew which to do, laugh or cry; in fact I felt like doing both at once, and I did both at once, as nearly synchronously as possible. I praised God then, and have often praised Him since, for such a man and such a work for the times. I cannot tell you how much I value your work. Almost every expression of praise has already been exhausted by others. Nothing is left for me to say, but that I most heartily and unreservedly indorse every grand and enthusiastic word ever spoken or written concerning the *Problem of Human Life*, and its immortal author.

Yours most truly,

S. C. FULTON, Ph. B.
Pastor 1st M. E. Church.

EXPERIMENTS AND EXPERIMENTERS IN SOUND.

BY CAPT. R. KELSO CARTER.

[Concluded from last month.]

JUST here I have an ugly question to ask Prof. Tyndall. As already quoted, he gives the depth of his bell-mouth jar as just 13 inches and states that this is just one quarter of a wave length, viz. 4 ft. 4 in. for the C3 fork at ordinary temperatures. Even Wilford does not seem to notice the discrepancy here. Tyndall says that 4 ft. 4 in. is just the length of a wave for the C3 fork. Of course we suppose he obtained that length by dividing 1,120 ft. the velocity of sound, by 256 vibrations. Performing the division we find that there seems to be something wrong in Tyndall's rudimentary Arithematic, for in spite of every effort the quotient will come out evenly and squarely just 4 ft. 3.6 inches, and no remainder. Do not let any one object that this is a hair-splitting difference; for I hope to show, before these articles are finished, that God in sound as in all Nature deals with figures without making the least error. Let us see how Prof Tyndall's slate-pencil can work from the other direction. He states that the depth of his tube is just 13 in. and that this is a quarter wave-length. Now for the velocity of sound. Multiply by 4 and 256, and again we are at

variance with the learned Professor, for we can't get anything but 1,109 1-3 ft. Now this should come out 1,120, for 60° F: or even to 1,150 for 70°, and I haven't a doubt that in a lighted public hall the latter temperature was far more likely. I have often heard of college graduates who with brand new diplomas in hand certifying to their knowledge of dead languages and profound philosophies, even yet unable to solve a problem in simple proportion; but it is a new curiosity in this direction to behold the "greatest living authority in sound" calmly and complacently ignorant of the fact that 3.6 is not equal to 4, much less 1,109 to 1,120 or 1,150. At other times we find Prof. Tyndall extremely particular about the variations in the velocity of sound due to temperature, but here he appears to forget that such a fact has existence, and in truth to forget the velocity of sound altogether except in a very general way. At page 26, of his *Lectures on Sound*, he describes the extreme precautions observed by the French scientists who tested sound velocity, in order that every fraction of a foot or of a second might have full value and consideration; and in the following ten pages he labors assiduously to make clear to the minds of his hearers the astonishing explanation advanced by Laplace of the discrepancy between the 1,090 ft. a second of actual observation, and Newton's calculated 916 ft. And that explanation rests entirely on a slight increase (supposed) in temperature in the condensed part of the air-wave. Yet in the experiment we have been considering, he seems to think that fractions of an inch are of no account, and temperature does not even deserve mention. On this point of temperature I have two or three facts to advance later that will show how vital a point it is in the matter, and which will also show conclusively the desperate weakness of the wave-theory. On page 36, Tyndall says: "The true physical philosopher never rests content with an inference when an experiment to verify or contravene it is possible." I would like to ask the Professor whether he ever did try all his forks over resonant tubes of various sizes. It was eminently possible "to verify" his statement that "this rule is general," but did he do it? I do not know how I can better close this chapter than by giving a few experimental facts derived from my resonant tube. Prof. Mayer says, p. 150, "If you make the column of air in the tube only one-eighth of the length of the wave it will resound to the octave of the fork. The depth of the air-column which resounds to the A-fork is 7.2-3 inch (7.4 correct). Push the cork up the glass tube till you have an air-column one-half of this length, or 3.83 inches. Now vibrate the fork

and bring it over the mouth of the tube. A clear flute-like sound comes forth. It is formed of the A-note of the fork mingled with its octave given by the resonant tube. *By properly varying the distance of the fork from the tube*, and both from the ear, you will after a few trials obtain a sound which you can barely distinguish from that of a flute." I will here mention that the distinguished acoustician Koenig, of Paris, states as a general law that a harmonic sound requires the same length of tube whatever be the diameter. Now this flute-like note mentioned by Prof. Mayer is the harmonic octave of his A-fork. By all authorities then the tube length for this should be exactly one-half that of the fundamental note. I carefully tried all three forks with my improved tube (after having failed to produce Mayer's result with his tube and cork), and I present the following surprising results:

For the

C3 fork	the harmonic	C4 sounded	for a tube	5.8 in.
C4 " "	" "	C5 " "	" "	2.5 " "
A " "	" "	A " "	" "	3.1 " "

Remember that the length for the fundamentals were 12.5, 5.7, and 6.9, and it will be seen in a moment that the harmonies in every case are signally *less than one-half*, instead of being "exactly" equal to it. But suppose we use these harmonic numbers for the velocity calculation.

Here they are: 5.8 by 4 by 512 vibrations gives 989.8 ft.
 2.5 " 4 " 1056 " " 880 "
 3.1 " 4 " 880 " " 909.3 "

I maintain that I have just as much right to use the length of the tube resounding to the higher octave as I have to use the lower, because Prof. Mayer and the rest assure me that it is "exactly equal" to use half the other, and hence if multiplied by the double number of vibrations necessary for the higher octave the same sound velocity is produced. I promised to show that one fork gave only 880 ft. as the velocity of sound a second according to the wave-theory; and I have shown it with a C4 fork of 528 vibrations made at Prof. Mayer's factory, whose octave harmonic of 1,046 vs. resounds from a tube of only 2.5 inches in length. But even this is but the beginning of the subject.

PA. MIL. ACADEMY, March, 1882.
 (To be continued).

WILFORD AND GENESIS.

BY REV. F. HAMLIN.

I HAVE been profoundly impressed by the philological testimony of Genesis to the truthfulness of Wilford's theory of intangible, incorporeal organisms. He has shown beyond

the possibility of successful contradiction, that not only light and sound, but the life and mind of every sentient creature, are substantial entities. After reading the "Problem of Life" it occurred to me that if within each animal form there is an invisible yet substantial vital organism, in some instances so dominant as even to build up lost parts, as in the case of the Salamanders' leg (thus furnishing presumptive evidence that the reproducer might, under God, have been the original producer), then it is but reasonable to believe that a similar state of things obtains in the *vegetable kingdom*: and if so, there might be philological evidence of the fact in the inspired record of creation. Now it is certainly fortunate (and we think providential) that the early records of creation were written in the Hebrew, a language in which the verb, by virtue of its variety of species, affords exceptional opportunity for expressing various shades of meaning, and it is to this striking characteristic of the Hebrew tongue that we are indebted for an indubitable proof of the truth of Wilford's theory of invisible, substantial organisms, as it applies to vegetable life and reproduction. Turning to Genesis i. 11, we read, "Let the earth bring forth grass, the herb YIELDING seed." I call attention to the species of the verb *Mazrea*, here translated "yielding."

If the writer had meant nothing more than the plant after its creation, casting and sowing seed, he would have written it as a Kal participle *Zoraa*; but it is here the Hiphil participle, and demands the *causative and producing sense*, and therefore signifies something entirely different from the Kal species. It means "Let the earth bring forth the herb, as seminating, or in its semination; that is a *growing* from an immaterial seminal power in the very beginning. This verb in its Hiphil form is found in but one other place in Scripture (Leviticus xii. 2), and there it evidently bears exclusively the *conceptive and seminitive* sense. Its choice *here*, therefore, had in view other than outward construction either of the plant as a whole, or of the seed-vessel, whether regarded as separate form or as contained in the plant. The thought is that mother earth gives the plant its body, *its external manifestation*, so far as that alone may be called the plant, but not its law, its idea, *its form, or its immaterial power*. And this "*yielding*," *growing, seminating power*, is not the seed-vessel, for that *dies in the process*; "*except a grain of wheat fall into the earth and die, it abideth alone*;" such dissolution only unfetters the invisible, immaterial, yet substantial prisoner that he may erect a new home for himself..

This immaterial power is not the result of organization (the earth does not originate it, but "brings" it "forth," manifests or reveals it); but it has in itself every outline of the seed it forms, and of the herb it produces; it builds the visible organism about itself. Just as the bee forms it waxen home, or the beaver builds his dam, or the bird shapes her nest, so this immaterial life-principle, clothes itself with matter which we call the visible seed. "Let the earth bring forth the herb as germinating in, or growing from an immaterial seminal form." This, (in view of its Hiphil species, and in the absence of the definite article) is the only exegesis that the passage will bear.

So just as Wilford teaches that the body of man or beast is but the clothing which the incorporeal organism puts on, so the visible seed in the vegetable world is but the covering of the substantial life-principle which God ordered into being. How much more reasonable is this theory than the Haeckelian view that "all organized beings are potentially present in the first matter of the nebular system?" This eminent scholar Taylor Lewis (the dread of sophistical and superstitious scientists the world over) has well said: "According to Haeckel, Newton was in the first toadstool, and so every toadstool contains a Newton!" And how striking is the harmony of philological truth, with Wilford's theory of incorporeal organisms! It would almost appear that if Genesis i. 11, is of God, so is this beautiful and irrefutable theory of A. Wilford Hall.

“THE OIDAL THEORY.”

[A Review by PROF. D. J. H. WARD, A.M.]

Editor of the Literary Microcosm:

PLEASE allow me to state before your readers some of the fundamental principles of a new theory of philosophy which has lately come under my notice, presented by one to whom, for the present we will give the *nom de plume* of "Howard." It is certainly novel in its character, interesting in its details, and, if demonstrated, grand in its bearings. Like other scientific investigators, he takes the Universe as it is, to indicate its origin and the powers by which its operations are continued, whilst he relies also upon what he deems basic facts and axioms as stand-points for every outlook or step into the unknown. Like other theorists he seeks to unfold the irrelations of mind, matter and force by disclosing the principles or methods of manifested energy.

Some of the features of this theory are:—

1. Matter, as such, is made and continued what it is through the constant operation of force.

2. One essential force to matter fills the interstellar spaces and all bodies.

3. A form of this force, which may be designated an "Oid," surrounds each body as a constant reinforcement of the energy that fills it; whilst these oids are constantly reinforced from the great oid, hereafter explained.

Some of the experiments in proof of these principles as related to inanimate matter are stated as follows:

Hold a normal (unmagnetized) bar of iron in a horizontal position and near to a magnetic needle. As is well known, either pole of the needle will be attracted by it. Hold the bar in a vertical position and near to the needle. Attraction and repulsion will now be exerted between the end of the bar and the needle precisely as two magnets attract and repel, showing the bar to be magnetized, through its vertical position by the assistance of some force connected with the earth; while the middle of the vertical bar will still attract either pole of the needle. But this attraction or repulsion of the needle from near the ends of the bar will be exerted at a distance five or six times greater than that between the horizontal bar and the needle when attraction was so exerted; showing, it is argued, a change in the form and extent of the oid (or form of force) around the ends of the bar, a resultant of polarizing forces which act constantly between bodies whose oids intermix, but especially manifested in connection with the vertical bar of iron. The extent around the bar of this manifested energy and the changes in this energy being determined, it would surely be a demonstration of the presence of a form of force which "Howard" designates an "oid."

If we reverse the ends of the vertical bar however frequently the same magnetic pole of the oid will be toward the earth's center and the opposite pole toward the zenith; proving that the polarizing force exerted upon the oid of the bar proceeds from the earth, or from toward the zenith, or from both. He says, "the polarization of the bar consists, at least partly, in a gathering and extension of the oid of the bar about its ends and perhaps also of a reinforcement of the oid from the oid of the earth;" and so also indicating a principal source of the force exerted in what is known as magnetic induction—the magnet used to produce this phenomenon serving to give direction to the force polarized; which force is mainly the oid around the inducted body.

In the absence of opposing evidence it is assumed that this polarizing force is mainly the attraction between the greater oid of the earth and the oid of the iron bar, and that it is a principle of the oids that their mutual attrac-

tions serve to polarize them, and that "*the greater oids exercise a controlling influence upon the lesser oids.*"

Form a bar of iron into a circle (its ends may be wedged) and hold it vertically near to a magnetic needle. The oid of this circle will exhibit the same polarity found in the oid of the vertical bar. This was tested with an iron wheel twenty inches in diameter, and revolving at a speed of 3,000 revolutions per minute; one magnetic pole of its *oid* was exactly toward the earth's center and the opposite pole toward the zenith—"nearly demonstrating," he adds, "that this polarizing force exerted upon the vertical revolving wheel is superior to mechanical motion, and perhaps also indicating that the essential action of polarization is a key to various manifestations of force in Nature."

Under that part of the *Law of Influence* which asserts that "A principle or method of force in any part of Nature operates (with similar conditions) in every part of Nature." "Howard" claims that "as the iron circle is polarized by the earth-oid, so also the oid of the earth is polarized by the greater oid of the sun—one of the earth's equatorial magnetic poles being constantly at noon and the other pole at midnight; thus explaining the cause of the high tides at the anti-sun and moon-sides of the earth.

It will be seen that this principle of vertical polarization also explains why trees and plants grow vertically; why persons must take a prone position to relax this magnetic and polarizing tension so as to secure good and rapid personal rest; why vertical bridge-rods become weakened in the course of years by the drawing away from their middle portion of a part of the force which constitutes the tenacity of the iron; and why old lightning-rods have greater lightning-attracting power than new ones, etc. It is also claimed that the phenomena of terrestrial magnetism so far as examined in the light of the "*Oidal Theory*," are explained in harmony with it.

It may be here stated that according to this theory *the oid of a person is double*—one part being the same sort of force which permeates all matter and surrounds all bodies, whilst the other part of our *personoid* is spiritual, like the mind.

But what may interest us more, is the claim that "the principle of the *oids* operates in connection with persons," and that there are sufficient facts on which to base the claim that a silent supersensible influence operates between persons to *impress*, to *generate thought*, and to *develope character*, and that such influence must be good or bad according to the real character and conditions of the persons from

whom the influence may proceed, whilst this "*personoid force*" may be directed and increased by the energy of man's will.

But the climax of this Theory is reached in the claim that "*the principle of the Oids operates also in connection with the Diety.*" If the powers of a man to know and think and will were infinitely enlarged what (or who) would such an enlarged man be? The principles and methods of force operating in the *finite man* would also operate in the *Infinite man*. The "*oidal force*" is the hand of man's thought and will connecting them to the parts of his body and also to other objects. (With other alleged similar cases, see an illustration of this in the moving of the table by a Committee of the London Dialectical Society as related by Joseph Cook in his Boston lecture, Feb. 9th, 1880.)

The *One Force* to and through matter (manifested as light, heat, magnetism and electric energy) is, in its primal essence, neither material nor spiritual. It is the *hand* of Wisdom and Will holding all matter. The fingers of that Hand are the *oids* that unfold every atom and every star and all inanimate as well as animate bodies. On the same principle of dependency the mind lives in an ocean of spiritual force suited to reinforce mind. These two forces, to mind and to matter, constitute the *Great Oid*, or the *personoid* of DIETY.

CHANGE OF MEDIUM IN SOUND.

Tuskaloosa, Ala., Feb 27th, 1882.

A. WILFORD HALL.

A little problem in acoustics has lately so engaged my thoughts I concluded to write you of it. Adjoining a billiard-room is a sleeping-room, a solid brick wall of ten or twelve inches being between them. Both rooms open into a corridor or passage, by a single door. If the doors of the two rooms are opened, the sound of the billiard balls are heard in the sleeping-room much more plainly than when the doors are shut—showing that the principal part of the sound heard comes, in a very roundabout way, by the air, through the open doors. But as solid bodies are better conveyers of sound than air, it would seem that the principal part of the sound ought to come through the brick-wall, a distance less than one third of that through the doors. In thinking of the matter I was reminded of a hypothetical suggestion ventured by you in your discussion of sound in the "Problem"—that is the reason why sound sometimes travels so short a distance when there are no apparent obstacles, is, that possibly there is such a thing as stratification of the layers of air, and these stratifications

may at one time favor, at another impede, the passage of sound. I don't know that my problem touches any such conjectured condition, but the stratification idea suggested to me an analogous explanation of the facts of my problem, viz., that sound is retarded by a change of medium. In my problem the medium in the one case through the open doors is continuous. In the other it is first air, then brick-wall, then air again. Besides this, the brick-wall is plastered and then finished over with a dense white exterior coat of finer lime or cement, so that on the direct passage the sound would several times change its medium. Now I suppose if the billiard balls were in direct contact with the brick-wall their sound would be heard more plainly than it is now heard through the doors. If this be so, may not this change of medium have something to do with diminishing its intensity? Truly yours,

J. A. GOREE.

REMARKS.

Prof. Goree has undoubtedly given the true solution to his own problem. There is evidently a repugnance in the substantial corpuscles of sound to change one medium for another, even a better one, and, as in the case of electricity, its conduction is weakened and retarded by its conductor being constituted alternately of denser and rarer substances. As proof of this repugnance, let the ear be pressed firmly against the plaster of the brick partition when the doors are closed, and the sound of the billiard balls will be more plainly audible than when the ear is removed. This is simply because there is *one change of medium less* to cause a degree of intensity.

A SINGULAR PHENOMENON.

Croton Falls, March 2d, 1882.

A WILFORD HALL:

Dear Sir: Having read with the greatest interest your views on the nature of Sound, and believing as I do that you have completely overthrown the "wave-theory," I take the liberty of sending you the following account of an Acanstic phenomenon which for a few months past has greatly exercised the minds of those living in this vicinity. The facts are briefly these: During the dry weather of last summer and while the Croton river was very low, a log dam, 30 meters in length and 2.5 meters in height was built extending across the river. As soon as the rains raised the Croton, causing it to pour over the top of the dam in considerable volume, a remarkable effect began to be generally noticed. Windows and doors that had hitherto behaved in a

proper manner began to shake and vibrate as though disturbed by an earthquake. This was particularly noticeable in those houses near the dam, though all the windows within *two kilometers* of the waterfall are more or less affected, but the vibration is felt at *that* distance only when there is no wind blowing. People waited, and wondered what it could mean, until at last, tired of the endless shaking, they drove wedges in their windows and in this way obtained some relief. That this peculiar vibration is caused by the water, I cannot doubt. A word as to the construction of the dam.

It is built of locust logs filled in with stone. Along the top runs a line of logs, which causes the water to fall in a series of waves, reaching from one end of the structure to the other. These waves in falling strike on a surface of logs and rock, and make a noise closely resembling that made by the rapid puffing of a locomotive. This noise however is not audible at a distance of more than 400 meters from the fall. As soon as the river rises above a certain mark, the waves cease, the water falls in an unbroken sheet, the windows and doors stop vibrating, and all goes well, but just as soon as the waters lower again, the rattling begins.

The number of waves falling over the dam per second are *seven* (7)—exactly corresponding to the number of vibrations as noticed in the windows, doors, &c.

Will you please explain the above facts on the corpuscular emission theory of sound? An explanation of *any kind* would greatly relieve the minds of many living at Croton Falls.

Yours respectfully,

GEO. F. CHAMBERLIN.

ANSWER.

It would not be entirely safe to attempt a definite explanation of the foregoing phenomenon, without a careful personal observation of the character of the ground, and the exact pitch and intensity of the sound produced by the falling water. But judging from Prof. Chamberlin's description we have no doubt the rattling is caused by ground-tremor, since the number of vibrations of the glass corresponds exactly to the number of waves that fall over the dam per second. One thing is certain that no sound can sympathetically produce a vibration of glass or anything else of as few as *seven* oscillations in a second since the lowest tone of the church organ, according to Prof. Blacerni's recent work, is constituted of as many as sixteen vibrations a second. Such a tone could only cause a window to vibrate sympathetically when the tensioned glass was tuned to the corresponding number of vibrations.

Hence, unless there be a clear mistake in the foregoing description of the phenomenon, it cannot be produced by the sound, but, as before remarked, must be caused by the great tremor.

Remember that seven concussions or vibrations in a second are not sufficiently rapid to generate any tone, however low. But seven concussions of falling waves to the second could produce seven tremors of the ground, and seven jars of adjacent windows in the same intervals of time, which state of facts probably accounts for the phenomenon above described.

EVOLUTION—DARWINISM.

THE time is coming and now is when theists of whatever religious belief must avow themselves frankly and take a decided stand upon this question of evolution or Darwinism. Scientists as a class have come out boldly in favor of the theory which teaches that man, with all the higher forms of animal life, has evolved, by slow and gradual steps of development from the fish, the ascidian, the worm, and the moneron. We say *scientists* as a class, for the number of scientific men who oppose evolution is now so trifling that they are scarcely to be taken into account; while the leading scientists who adopt the theory look upon such stray sheep of their fold with a contempt only second to that which they feel for religionists who presume to question anything within the pale of science, which these investigators presumptuously pretend is their own exclusive field of inquiry. This confident front exhibited by leading naturalists has so intimidated the clergy of this country and Europe, especially those who have made pretension to a smattering of scientific lore, that they have, at least many of them, taken admonition of their fears and *hedged*, as the gambler would term it, by half-agreeing with the out-and-out evolutionist by conceding what they call theistic evolution—that is Darwinism pure and simple with the supervision of an overruling Providence thrown in. Darwin was only too glad, in starting his radical theory, or when first publishing his *Origin of Species*, to court these scientific divines and even cajole them into this reluctant admission that all animals below man were evolved from a few simple forms of life; and he even went down to them on one knee by talking reverently, though in a half-suppressed whisper, about the "Creator" having "breathed into a few simple forms or into one," as a concession that he thought would fairly compensate for such clerical aid. But step by step the evolution boa-constrictor has silently and al-

most imperceptibly extended its coils around these religious representatives till the pressure has now encircled the very vitals of the church, and clergymen, even those who make no special pretensions to a knowledge of natural science, have come to show no secrecy in avowing themselves Darwinian evolutionists.

In the introductory chapter of the *Problem of Human Life* we showed that as eminent and representative clergymen as the Rev. Joseph Cook, of Boston, and the distinguished president of Princeton College,—Rev. Dr. McCosh,—were avowed evolutionists of the theistic type. A few timid friends, on seeing the plate-proofs of this chapter advised us to modify them by leaving out such a serious charge against those eminent divines, as it would in their judgment hurt the cause of religion and damage the sale of our book. We positively refused to take counsel of their fears by changing a syllable, but published the work not only containing the charges but with the overwhelming evidence of their truth. The condemnation there recorded, of such premature and uncalled-for concessions on the part of the learned clergy to the half-developed conclusions of atheistic theorists, we are glad to say, has been received with shouts of joy by more than ten thousand clergymen who have purchased the book,—pure and noble Christian workers who do not yet see the necessity of calling in the aid of materialistic evolution to help out the problem of God's creation of the universe. A few, however, of the dignified (!) clergy who are above examining any book that is not heralded by learned societies of the so-called scientific sort, have shut their eyes to the humble light of the facts and arguments of the work named, and still grope their way in the tenebrous shadows cast over the religious world by the pretentious works of Darwin, Huxley and Haeckel. As an illustration we have proofs, strong as holy writ, that right in this city some of the most eminent divines make no attempt to conceal their belief in the doctrine of evolution, even pure and simple as taught by Darwin. As a proof of this fact we have been informed by a prominent clergyman who was present at a recent assemblage of some two or three hundred ministers of the Methodist Episcopal church in this city, at which the most prominent clergyman present publicly announced himself as a Darwinian evolutionist. We were not present, of course, but we have the facts from one of the ministers of that body with whom we are intimately acquainted. What was most remarkable about this declaration, as we learn, was the perfect *nonchalance* and indifference to consequences with which the announcement was received by a vast ma-

jority of those present, though a few protested that no man could make such an avowment, and honestly accept the Bible account of creation.

In view of these and similar facts, widely scattered over this country and Europe, what Christian minister or layman, who takes an interest in the future of the church or in the paramount authority of the sacred Scriptures in matters of religion, can fail to comprehend the importance of the conflict now being waged in these columns against the insidious doctrine of evolution and its legitimate parent-theory—spontaneous generation? The fight of atheistic materialism for supremacy has by common consent of infidel science been narrowed down to the single question of the evolution of all organic beings, including man, from the worm and the moneron. Shall this entrenched fortification of unbelief be taken by the invincible artillery of truth properly manned, or shall the church surrender to its already spiked guns? This is the question to be discussed in this journal.

THE CHRISTIAN ADVOCATE ONCE MORE.

JUST as we expected! Among the important questions considered by the New York East Methodist Conference held recently at Waterbury, Conn., was the signal falling off of the subscription list of the *Christian Advocate*, its cause and its remedy.

Many of the members attending that Conference *knew* the cause of this decline only too well, but out of respect to the feelings of the editor, Doctor Buckley, they no doubt were induced to keep silent. The Doctor attributed the cause to the absence of premium offers in the paper! Let us assure the editor that this is not the real trouble. We have it in our power to solve the problem to the satisfaction of every candid member of that Conference, and to demonstrate that the most powerful agency in working this decadence, has been the dishonorable course pursued by Doctor Buckley in his original notice of the *Problem of Human Life*, and his unmanly refusal to right the wrong after it was so clearly pointed out to him. Every minister who takes that paper has learned through *The Microcosm*, the facts in regard to the course of the *Advocate*, as so terribly exposed and driven home in the August number of this paper. If the ministers who support that journal want light on the cause of this serious falling off in the circulation of their chief denominational paper, we can furnish it in the shape of more than three hundred letters from Methodist ministers who take *The Microcosm*, and who condemn in the bit-

terest terms the course of Dr. Buckley in the matter, many of them declaring that they can never work for the paper again so long as it remains under his editorial management. We have been surprised at the number and unanimity of these letters. If Dr. Buckley wishes to give the *Advocate* readers the true cause of this falling off, let him not lay it to the absence of premium offers of chromos, sewing machines, &c., but let him state candidly in an editorial that it is principally owing to an unfortunate blunder that occurred last May, a year ago, in printing a book-review written by an evolutionist on purpose to injure the *Problem of Human Life* in retaliation for its crushing blows against Darwinism! Let him then make a frank confession to the readers of his paper of the unmanly part he himself took in shielding the culprit from his just deserts by refusing to rectify the wicked wrongs thus done the public. If this does not revive the confidence of his readers, then the only remaining course will be for him to step down and out and let some one else more worthy assume the duties of his responsible position.

As a specimen of hundreds of letters from ministers, who formerly took an active part in working for the *Advocate*, and thus keeping up its list of subscribers, we copy the following extract of a letter just received from the Rev. Dr. Fulton, of Pittston, Pa., whose opinion of the book in question is given on another page:—

"It is imperative upon Dr. Buckley to rise and explain, and to make due acknowledgment and amends for his serious criminal blunder. It is difficult to account for the mistake made, but it is immensely more difficult to account for the Doctor's persistent silence and dogged refusal to acknowledge and make amends for his wrong. As a minister in the same church I must say that his action regarding this matter is exceedingly mortifying and embarrassing to myself and others of my conferees. The Doctor has already lost caste in the estimation of fair and thoughtful men, both within and without his own church. Few will care hereafter to turn to the columns of his paper for trustworthy and authoritative statements concerning any work under review. To very many he whose utterances were esteemed oracular, will cease to be an oracle. Already many have lost much of their wonted respect both for him and his paper. A man that ignorantly or jealously could write such a notice as appeared in the *Christian Advocate* of such a work as *The Problem of Human Life*,—the greatest and best in its field beyond all comparison that has yet appeared, ought to be so unspeakably ashamed of himself, as never to venture to speak or write another word for the public ear or eye, until full confession has been made and complete absolution granted. Even then the silence were better continued, were it not that possibly he might still be able to do some little toward righting the wrong he had perpetrated against God and his fellow

Here, reader, is the complete opening of this able review in a great college paper, and if you can find the "it" that one naturally looks for after the "namely," you can take *The Microscopist's* hat! We learn from one of our subscribers that the city of Tiffin is in a roar of laughter at the success of the plot.

THE DIATONIC SCALE.

PROF. JOHN N. JANNEY, of Sweetwater, Tenn., asks:—"Why does the diatonic or natural scale include two semi-tones, one between the third and fourth, and the other between the seventh and eighth notes?"

We give it up. Nature has so organized and ordained the human voice that this arrangement of five tones and two semi tones should constitute the musical scale, so beautifully adapted to the human ear as well as to the vocal organs. This arrangement, into which the sweetest pleasures of music to the auditory God without being able to comprehend the reason for it.

CENTRIFUGAL FORCE.

PROF. T. SANFORD, of Mt. Morris College, Ill., propounds several queries involving the action of centrifugal force. They are on the same principle as the one we here quote and answer:

"If a stone be tied to one end of a string, and the other end be held in the hand while the stone is made to swing in a circle around the hand, we know that the stone will pull upon the string with a force that increases as the velocity of the revolving stone increases. Are the rays of centrifugal force, which are thus sent off from the hand, the cause of the stones pulling upon the string, or is it due to the "tendency" of the stone to move in a straight line?"

We answer both. The mechanical movement of the hand, which gives motion to the stone sends rays of centrifugal force out to the stone, in circling round the hand, to pull on the string and thus try to get away. Should the string break, the stone would fly away in a tangent from the point in its circuit where the break occurred. But the substantial rays of force from the hand through the string are also all the time passing off from the stone in its circuit, the same as they would pass from its periphery of a revolving wheel composed of a continuous line of stones. Should one of these stones break away from the periphery by rapid rotation, it would only follow the actual tangent of this sphere! And the way he does

men. But what shall be said of him who, after his error has been pointed out and urged upon him again and again, continues to let it go uncorrected, thereby using the influence with which an exalted position happens to invest him for the time, to destroy a work he ought to have been foremost in commending, and in whose success he ought to have been one of the most interested? What shall be said of him, other than that he ought to be compelled to rectify and make amends for the wrong he has perpetrated? &c., &c.

PROF. HORNING AND NEWTON.

The Heidelberg Monthly Journal a paper published by the College of that name at Tiffin, O., prints a long review of our March article on Newton and Gravitation, by one of the leading professors of that institution—Prof. C. Horning, A. M. We do not propose to reply to this review at all, as the professor's points are all more than met in our replies to Prof. Goodenow, the first of which appears in this number of *The Microscopist*. We do desire, however, to call attention to the literary ability of the man who is thus put forward by that great institution of learning as its champion to vindicate Newton against the ruthless assaults of the "Don Quixote" of *The Microscopist*, as he poetically calls its editor. We shall only quote, verbatim et literatim, the opening passage of his review, and then leave this literary prodigy of Heidelberg College to the tender mercies of the grammar classes of that famous seat of education, and to the commiseration of the school-teachers of Seneca County. It seems that some of our numerous subscribers in that county had conceived the innocent plot of organizing a little fun at the expense of Heidelberg, by guying this confiding professor into an attempt to reply to our article, in order thereby to aid us in advertising *The Microscopist*. They wrote him begging of him for the sake of science to reply to our article, and ended in these words:—"vindicate Newton, and immortalize yourself." The graph opens the ball:

"Well," vindicate Newton against what? Why, against the attack of A. Wilford Hall in a paper edited by him called *The Literary Microscopist*, in the March number of which he publishes an article entitled Newton and Gravitation, in which, by the aid of a diagram and four or five columns of words, he thinks he proves that Newton's fundamental law, namely, [now see what becomes of his sentence!] that the attraction of the earth exerted upon bodies at or above its surface, varies inversely as the square of the distance from the centre; or, which is the same thing in the language of Newton, "as if that whole attracting force issued from one single corpuscle placed in the centre of this sphere!" And the way he does it [what?] is superlatively amusing!"

gential course taken by the rays of force constantly passing off as the wheel revolves. This "tendency" of the stone to fly off in a tangent is owing to the actual flight of force-rays constantly taking place during rotation.

PUBLISHING FAVORABLE NOTICES.

ONE of our subscribers objects to our publishing such flattering notices of our own book and paper, and thinks it shows a lack of modesty. He forgets the passage in the third epistle of Peter, second chapter and first verse, which reads:—"Blow ye your own trumpets, for if ye blow them not, then verily shall they not be blown." How does this unreasonable subscriber expect the world to find out that we have written a great book if we modestly keep all these flattering notices to ourself? We are modest to a fault, but our modesty sometimes takes a business turn. If our book is really doing good, as these testimonials prove, what is *The Microcosm* for but to spread such good news abroad and let as many as possible enjoy its benefits? We do not care the toss of a penny for these enthusiastic commendations, so far as it affects our personal pride, for we have long since parted with the last vestige of vain glorious sentiment. But we do care to give strangers the benefit of the favorable opinion of those who have carefully read the *Problem of Human Life*, that they too may thereby be induced to read for themselves and thus be made partakers of the same benefits. We do not begin to be a *Moses*, even if some of our enthusiastic readers have so represented; but we have endeavored, standing on the *Mount Sinai* of common sense, to proclaim to the world certain of God's laws of Nature, and thus to refute the pernicious materialistic theories of modern science which have so impudently essayed to dethrone the Almighty. We rejoice that our efforts have been, to a degree, successful, and that the "Problem" is doing good service in the cause of religious truth; and we publish these "Kind Words" from the friends of the book alone in the interests of the cause to which we are devoting our life and our energies. Is this explanation satisfactory?

PROF. GOODENOW ON GRAVITATION.

WE give in another place Rev. Prof. Goodenow's reply to our article on Newton and Gravitation printed in the March number of *The Microcosm*. We ask those readers who take sufficient interest in the discussion to read it at all, first carefully to read the Professor's criticisms that they may the better be able to

judge of the force of our answer. This is but fair to the Professor as well as to us.

Our critic shows a remarkable confidence in the correctness of his opinions, as one naturally would who was but reiterating and elaborating the views of such a philosopher as Sir Isaac Newton, which he had imbibed from his youth. And it is also quite natural that he should look with considerable contempt upon any positions opposed to the views of such world-renowned authorities as Newton, Kepler, Herchel, etc. But nevertheless, we trust the reader will not feel the same degree of contempt after having carefully considered what follows.

Now in all this long paper of Prof. Goodenow's there are but two important or cardinal considerations urged against our general position. (1.) One is entirely against a position we have never taken, and upon which Prof. Goodenow evidently is laboring under a serious misapprehension, namely, the effect of the lateral pulls of gravity upon the body at 1 as compared to the pull upon the same body provided all parts of the earth were removed or condensed to the centre *S*, leaving the body where it now is. (See diagram in March No.) We never denied but that the body at 1 would continue to weigh about the same, in case of such condensation, as it now does, owing to the manifest change in distance of the earth's substance in relation to 1, which would about counterbalance the present effect of diagonal and contrary pulls. This will appear in due time. We were certainly aware that the removal of that portion of the earth, near the body at 1, to the center, *S*, would lessen the general attraction upon 1 more than the bringing of the lower portion of the earth up to the center would add to it. Prof. Goodenow has entirely mistaken our argument upon this point, and in this respect stands on an equality with the unsophisticated scientific (!) editor of the *Christian Standard*, and the learned (!) Prof. Hornung, of Heidelberg College, at Tiffin, Ohio. But the exposé of this singular misapprehension we will be obliged, for want of room to postpone till next month, simply remarking that if this caricature of our position was the "false scent" our critic struck when he was "younger and greener," no wonder he figured himself out of it. But remember that even with this "false scent" he admits an absolute loss of weight to the body at 1 on account of these contrary side-pulls of *more than one-eighth*—exactly ".8576." The reader will please stick a pin here, as we shall have a place for this admission before closing our present answer.

(2.) The other cardinal consideration, and

that upon which the greatest possible stress is laid, as conclusively breaking down our objections to Newton's law, is the fact that since a heavy body at the surface of the earth falls, in round numbers, say, 16 feet in a second, and since the moon in passing around its orbit, falls from a tangent toward the earth the one 3,600th as much in the same time, which is the inverse square of the 60 radii of the earth from here to the moon, it demonstrates, as Prof. Goodenow insists, that gravity decreases from the earth's centre as the inverse square of the earth's radius, and hence, that a body here must weigh 60x60 (3,600) times as much as it would weigh if removed to the moon's orbit. Hence the grand conclusion is arrived at that the real gravity of a body at the earth's surface is not practically affected by the contrary angles of the earth's attraction as shown and argued in the March number of this paper. We shall first consider this strongest of all arguments in favor of Newton's general law.

When we state that this is the only important consideration, and the only matter called a *demonstration* presented in Newton's *Principia* in favor of the earth's radius as the proper unit for measuring the decrease of gravity, we state what every astronomer or mathematician knows. And this same so-called "demonstration" about the proportionate fall of the moon is the only thing urged by Prof. Goodenow in favor of such unit of distance, and which he says we have admitted to be correct, and to prove which he makes lengthy quotations from our letters. Here again he misapprehends us. We admitted the above named fact of the fall of the moon from its tangent a distance corresponding by inverse-square to the 16 feet fall of a body at the earth's surface in one second, as stated by Newton, and we also admitted that he gave Newton's demonstration correctly, but in the same words we denied the law and the correctness of the pretended "demonstration" of it by Newton and his followers. We will show right here in this answer that the Professor's conclusion in regard to the earth's radius as the unit, deduced from the facts stated by him and admitted by us, as going to prove that gravity decreases 3,600-fold from the earth to the moon because of these concurring facts, so far from a "mathematical demonstration," as he and Newton call it, is a fallacious deduction, and not only *guesswork*, but one of the weakest and most *barefaced tricks* of philosophy ever incorporated into a scientific law or theory! This we admit to be fearfully strong language to use with reference to anything in Newton's *Principia*, but we emphasize it with the full weight of our responsibility and the serious character of this charge before

our eyes. And here we may truthfully state that should this so-called "demonstration" fairly break down and be proved, as charged, either a trick or an inexcusable blunder on the part of Newton, neither Prof. Goodenow nor any other astronomer would any longer contend for the earth's radius (4,000 miles) as the proper unit for estimating the decrease of the earth's gravity. As proof of the correctness of this inference, look at the importance Prof. Goodenow attaches to this single formula and his argument based upon it. So essential does he consider this great "demonstration" of Newton's law, that he calls it the "real, true *yard-stick*" by which Newton measured the decrease of gravity from here to the moon. He calls it a "*mathematical demonstration of an undeniable fact*" (italics his); a fact *absolutely settled* by pure mathematics," "the chief, decisive part of my letter;" "*beyond all possibility of mistake*;" "*a fact mathematically and correctly proved by Newton and by myself*" (italics still his); and thus he goes on exhausting the strongest words in Webster by which to show the conclusive character of this most perfect and "undeniable" of all Newton's "mathematical demonstrations." He says further, that so far from being *guesswork* or an *assumption*, as we charge, it is a "visible and evident value" and not an "unknown quantity." And after turning this formidable, sweeping, and fundamental fact of Newton's law over and over, and presenting its logical conclusiveness in every possible light, he asks triumphantly, as if to silence our batteries and spike our last gun: "Is not the fall of a body 16 1-12 feet or 193 inches in a second a well known fact? Is it not a *real measure of gravity* at the earth's surface? And was it not with this as a *real, true yard-stick* that Newton measured the fall of the moon each second from its tangent? And does not this *measurement* show that 193 inches per second, of gravity-fall here is 3,600 times as much as the gravity-fall of the moon per second?" Then he follows up this bombardment of questions with the ridicule of the editor which he deemed only just to the readers of *The Microcosm*.

Let us now break this "real true *yard-stick*" of Newton into a thousand pieces, and scatter them among the debris of the dozen or more yards of fallacious argument which Prof. Goodenow has measured off by it, and the reader will then see that Newton's assumption of the earth's radius as the true unit for measuring the decrease of gravitation, as determined by the rate of the moon's fall, was not only "*guesswork*" but a barefaced deception perpetrated upon the scientific world. This we will immediately make so plain that Prof.

Goodenow will be ashamed to the day of his death that he ever used the language concerning this "demonstration" which we have just quoted.

First, however, we readily admit that the moon is kept in its orbit by the attraction of the earth pulling it constantly and uniformly from its rectilinear course, and that this continuous fall of the moon toward the earth *happens* to be in a second of time nearly the 3,600th part of the 16 feet fall per second of a body on the earth's surface, as Newton figured. We not only assert that this fact merely *happens* as a coincidence, but we will now prove it. And to this end we here present the important inquiry, which probably never occurred to the mind of Prof. Goodenow, namely, what right had Newton, in making this so-called cardinal demonstration, to select a "second of time" as the basis for formulating his ratio of gravity-decrease, rather than some other small interval or fraction of time? Did it ever occur to the reader that it made any difference? If not let him read. Would not *half a second* of the fall of a stone be as much "a real measure of gravity," as much a "real true yard-stick" at the earth's surface, as a *second* would be? We assert that it is a *truer* measure of gravity than a full *second*, as it has less of the effect of *momentum* or accelerated motion mixed up with the real action of gravity! Why, then, did not Newton take a *half-second* fall of a stone at the earth's surface and a *half-second* fall of the moon from its tangent, and then make the mathematical comparison for establishing his astounding "demonstration"? Plainly the reason was, that such a "yard-stick," and such a comparison, though nearer the real "measure of gravity" on the earth, would have utterly spoiled his ratio of decrease, and would have completely smashed the earth's radius as the unit! Remember that the fall of the moon toward the earth from its tangent is not an *accelerated* motion. It is a *uniform* fall, just *double* as much in a second as in a half-second and *vice versa*: while a stone's fall here is just *four times* as much in a second as in a half second! But by arbitrarily selecting a *second* of time, which Newton found by trial very nearly to match the fall of the moon in the same time, and which as before observed happens to be about the 3,600th part of 16 feet, it brought out his renowned "demonstration" all right! But if a half-second of time had been selected by Newton, which was a better, and truer, and honester, "yard-stick" than a full second, then the moon would have been found to fall just double as fast as would have matched the important unit of the earth's radius! Why is this the case? Mani-

festly because a stone falls at the earth's surface only *four feet* in half a second instead of *eight feet* or the half of sixteen, while the moon falls in half a second the inverse square of *eight feet* as surely as it falls the inverse square of sixteen feet in a second: Hence it would not have done for Newton to select the truer "yard-stick" of half a second's fall of a stone, and compare it with the moon's fall during the same interval of time, since it would have made the moon's fall just twice as great as required to fit his pretended "demonstration," and since this would have made the gravity of the earth exert just double the force at the moon required to match his assumption of the earth's radius as the unit, and this, as the reader sees, would have demonstrated just what we urged in the *March Microcosm*, namely, that only about one-half of the earth's real gravity takes effect upon a body at the surface, or is converted into weight. Was ever triumph more complete than ours over Newton's bogus "demonstration," in that by taking his own "yard-stick," improved one-half, our position as to the true gravity of the moon has been absolutely sustained? And was ever scientific revenge meted out more justly or signally upon a poor editor's merciless critics than here wreaked by beating Newton's law to death with his own "yard-stick," and then converting one-half of the same stick into an honester measure with which to demonstrate our own theory? We trust that Prof. Goodenow will pardon this harmless jubilation of the ridiculed editor at the expense of his own disabled weapon. Let us now look seriously and calmly at the evident trickery and absurdity of Newton's moon "demonstration."

It requires but a moment's thought to see that it is supremely illogical, to say the least, to estimate the force of the earth's gravity exerted at the moon by the rate of its fall as compared with the fall of a stone here, selecting any small interval of time, when the fall of the moon is without any acceleration whatever, while the stone's fall in a second, on the contrary, is nearly all made up of acquired momentum! The actual *commencement* of the stone's fall when let drop, and when gravity alone acts upon it or before any cumulative momentum is added to its motion is manifestly the only "real measure of gravity at the earth's surface" so far as this fall of a stone is capable of forming such measure. We appeal to the common sense of every student of natural philosophy as well as every teacher of astronomy if we are not correct. Yet this motion, caused by the action of gravity alone, at the absolute commencement of a stone's fall, is not probably at the rate of a quarter of an inch in a second!

What philosophical presumption to wait till the stone has fallen 16 feet, and thereby gained nearly all of its velocity from momentum, and then triumphantly proclaim these 16 feet as the "*real measure of gravity on the earth's surface*," when more than ninety-nine hundredths of the fall is not the effect of gravity, but of acquired motion! As well wait for the stone to fall a distance of five miles, and until it has accumulated a velocity of motion greater than that of a rifle bullet, and then call this the "*real measure of gravity on the earth's surface*"! What would become of the moon's trifling fall in such a case? Yet startling as the absurdity is, Newton calmly and "*mathematically*" bases the most important "*demonstration*" connected with his law of gravity upon the uniform fall of the moon (without any acceleration gained by acquired momentum), deduced alone from the fall of a body on the earth's surface in which acceleration is the predominant feature and in which gravity pure and simple does not do a hundredth or perhaps a thousandth part of the work! A scientific investigator at the present day who would presume to publish to the world such an unspeakable philosophical absurdity and call it a "*mathematical demonstration*," would be riddled with criticism and jeered into merited obscurity in less than a month. Yet Newton is embalmed in immortal remembrance with this *lunny* "*demonstration*" as one of his principal achievements.

In analyzing this argument we must remember that *seconds* are arbitrary divisions of time instituted for human convenience, and that they have no necessary connection with the phenomena of Nature. But it would almost seem that Newton regarded the "*second*" as a fixed adjunct of Nature's operations ordained by heaven at the same time that the moon was hurled forth from the hand of the Creator; and that a *second* of time on earth, in the fall of a stone 16 feet, was exactly fitted by Providence to the moon's fall during the same period in order to help out his demonstration of the earth's radius as the true unit for measuring the decrease of gravity. Surely another period or fraction of time of *two seconds* duration would have been just as convenient a "*yardstick*" as would have been a period one second long! Why did not Newton take such division of time on which to build his "*mathematical demonstration*?" The reason is plain; a stone falls 64 feet in two seconds, while the moon's fall from its tangent toward the earth is only the 3,600th part of 32 feet in the same time! This would make gravity at the moon only half strong enough to fit the all-important radius unit of decrease upon which much of his law has been based, and would in that

event only pull the moon half as fast in proportion to distance as the stone falls! But again: Why did not Newton select a *quarter-second* as his "*yardstick*?" Surely that is nearer a "*real measure of gravity*" on the earth than a *second* would be, because it has much less momentum or accumulated motion mixed up with the pure and simple work of gravity. But here comes the trouble, which Newton evidently saw in the way of his startling "*demonstration*," since Prof. Goodenow declares that Newton "*knew a thing or two*," and even understood all about "*side-draft*," with which every farmer is familiar! Newton was not a *green* beginner in mathematics, but was smart enough to see that a quarter-second of the fall of a stone as his "*yardstick*" would have been still more disastrous to his radius-unit assumption, and would have utterly exposed the shallowness of his guess-work "*demonstration*," because a stone, he well knew, only falls *one foot* in the first quarter of a second, or at the rate of only *four feet* in a second, which was but *one-fourth fast enough to match the moon's fall from its rectilinear course*! But Newton had just as much mathematical right to select a *quarter-second* as to fix upon a *second*, and would, as we here see, absolutely have done so had the rate of a falling body in that interval fitted the fall of the moon in such manner as to help out his pretended demonstration! We admit that this seems hard on the memory of the immortal Newton. But is it just? If there were no secret purpose to serve in making things fit, how did Newton and Prof. Goodenow after him, happen to get hold of the precise "*yardstick*" that fitted the moon's fall and so "*infallibly*" demonstrated the earth's radius as the proper unit of measure, when there were whole piles of yardsticks lying around, some of them much more accurate than the one they selected? Echo answers—"how"? Newton evidently must have known it to be only a trick of cut-and-try philosophy and guesswork mathematics! But what shall be said of Prof. Goodenow? He tells us that when he first doubted Newton's law he was "*greener*" than he is now! Hence, while becoming enthusiastic over Newton's "*demonstration*" and wildly brandishing his lucky "*yardstick*" of one second to the imminent danger of the editor's eyes and knuckles, he must have known, as one would think, unless he was still becoming "*greener*" that the yardstick of half a second in length would have been a much more accurate "*measure of gravity at the earth's surface*" than the one with which he so recklessly beat the air! And knowing this, he must have seen at a glance that it exactly proved our position in the March

Microcosm to be correct, namely, that the action of gravity at the earth's surface in downward pull was only about half what its proportionally reduced effect would be at the moon! But we do not believe that the Professor got a glimpse of any other "yard-stick" than the one he used, or that he knew any better than to suppose that a *second* of time was an eternal adjunct of Nature's operations exactly adapted by the Creator to the stone's fall and to Newton's peculiar "method" of demonstration! Hence, we do not think he has *ripened* a bit since he first got on that "false scent," and that the *greenest* period of his long and eventful life was the time when he sat down to write the article to which this is a partial reply.

But seriously, in facing the philosophical facts and mathematical considerations here pointed out in regard to a stone's fall, so utterly ignored by Newton and Prof. Goodenow, as relates to the earth's diminished attraction at the moon, it seems difficult to avoid the conviction that this pivotal "demonstration" of the law of gravity was purely the result of a cut-and-try policy by Newton till he had found the fraction of the time of a stone's fall which would fit a corresponding fraction of the time of the moon's fall, and which *happened*, as we now see, to be about a *second*. This partial coincidence then readily took the shape of the "demonstration" recorded in the *Principia*, and which is so heralded and reiterated by Prof. Goodenow,—a demonstration, without one mathematical fact or fair philosophical inference to support it. We say "this *partial* coincidence," for we deny that the *second* of a stone's fall *exactly* matches the *second* of the moon's fall by squared-distance-inverse. We deny it on the law of chances if we had no other reason, since we have proved it to be all chance or cut-and-try, without the first element of mathematical demonstration entering into the formula. Prof. Goodenow virtually contradicts himself by admitting that the stone at the surface of the earth lacks of the full effect of gravity *more than one-eighth*, owing to contrary side-pulls of the earth's attraction, which deficit in the stone's gravity is made up proportionally in change of angle by the time it reaches the moon. Yet with this one-eighth lacking in the full force of gravity exerted on a body at the earth's surface, which is restored at the moon, the stone still falls, Prof. Goodenow says 16 1-12 feet here, which should be *one-eighth too little to fit the full gravity-force at the moon*, himself being judge! Yet they beautifully match! Then he contradicts Newton who says in a dozen places in his *Principia* (see page 453) that a stone falls 15 feet, 1 inch

and 1 to 4 lines, according to latitude, in a second, while Prof. Goodenow puts it down exactly 16 1-12 feet without any reference to latitude! We have placed it for convenience in calculating at 16 feet in round numbers, thus splitting the difference between them. Now how can the demonstration be "exact," and "absolute," and the result be one of "pure mathematics," both with Newton and Prof. Goodenow, while yet they differ a foot in their statements of the same identical fall of a stone in one second? Echo again answers—"how?"

Thus we have evidences of "guesswork," and of trying to make things fit, all along the line and at every turn of this gravitation wheel. Had it, as before remarked, taken two seconds of the stone's fall to secure this fit, we see no reason for doubting but that the two seconds, and the 64 feet fall of a stone, would have constituted the "real, true yard-stick" of Newton, and been incorporated as a part of his "mathematical demonstration." Prof. Goodenow charges that we do not understand Newton's "method." Possibly not; but we venture to give our impressions of it.

Finally, we remark upon this chief, fortified position of the gravitation theory, now utterly stormed and its guns spiked, unless our arguments upon the falling stone and the falling moon can be met and answered, that Prof. Goodenow's only possible escape from worse than ignominious rout will be the forlorn hope of trying to demonstrate by some other "yard-stick" that the moon's fall from its tangent is also an *accelerated motion* toward the earth, the same as that of a falling stone! This positively would seem the only thing that can put the breath of life into Newton's "demonstration" or make it anything but sheer guesswork as charged. But the fact that the moon has been thus falling continuously from its tangent toward the earth for more than sixty years in the Professor's own observation, without coming any nearer a terrestrial collision, will probably tend to deter him from further danger to his scientific reputation by such a defence of Newton's law. For the present month, therefore, adieu.

THE GRAVITATION QUESTION.

BY REV. PROF. SMITH B. GOODENOW.

THE Gravitation Law of squared-distance-inverse is proved to be absolutely certain by *three* independent lines of mathematical demonstration.

DEMONSTRATION I. By Kepler's Third Law. This I pointed out briefly in my second letter

published in the *Microcosm* for February. A gentleman has written me from Oregon, asking me for the particulars of this demonstration; and I have sent them to him. That Third Law thus proves the inverse square of distance to be for certainty the law of centripetal force holding the planets in their orbits. Having been discovered by Kepler, before Newton's time, its certainty does not insure the additional features added by Newton to make up the complete Gravitation Law. It now appears, that the Editor of the *Microcosm* does not question the Law, so far as the Kepler part of it goes. In other words, he does not deny the law of squared-distance-inverse as governing the planets or other bodies at a great distance from their center of motion. But what he *did seem* to deny, is the added doctrine of Newton, that the same law comes down from distant planets to the surface of the central sphere, say from the moon to the earth's surface; making the gravity or weight of a body here to vary from its weight at the distance of the moon, by this same law of squared-distance-inverse.

DEMONSTRATION II. Newton, Herschel, and other astronomers have demonstrated mathematically and beyond all possibility of mistake, that the added doctrine of Newton IS A TRUTH, that the orbital curvature of the moon and gravital curvature at the earth do vary as squared-distance-inverse. And I gave the demonstration in a simplified form in my second letter to the Editor; thinking he would see the point, and perceive the impossibility of controverting a fact thus absolutely settled by pure mathematics, and so would hold back his proposed argument against it. But instead of taking in the demonstration, though distinctly acknowledging its correctness and certainty he dropped out that part of my letter as of little consequence, when he put into the Feb. *Microcosm* other parts of our private correspondence, so unexpectedly to me. That is, he passes right by the mathematical demonstration of an undeniable fact, (the chief decisive part of my letter); and, after a flourish of trumpets over the less consequential suggestions and over the overthrow of Newton about to come, he proceeds in the March No. to give us at length that crushing overthrow, namely, the alleged overthrow by the Editor of a fact mathematically and correctly proved by Newton and by myself, as he himself plainly declares! That the accuracy of my demonstration (drawn from Newton) is very strongly affirmed, will be seen by turning back to the Editor's "Reply" to my letter in the Feb. *Microcosm*, where he says: "I believe as firmly as you do, that gravity varies inversely as the square of the distance from any

given atom of matter which sends out those mysterious rays towards any other material atom. I am well aware also of the action of the earth's aggregate gravity upon the moon, by which it is kept in its orbit, and that it is this manifest decrease of the earth's gravity as the square of the distance, by means of which astronomers are able to predict with mathematical certainty the movements of the planets and satellites," etc. Also before, in the note where he drops out my demonstration, he calls it "a lengthy and correct mathematical statement of the manner in which the moon is kept in its orbit, by the attraction of using the decreased as the square of the distance, and using the earth's radius of 4,000 miles as the unit."

That is Newton has proved, and I have proved, by "correct mathematical statement," that the "decrease of the EARTH'S gravity as the square of the distance" to the moon, "using the earth's radius as the unit," is what explains how the moon "is kept in its orbit," and shows the earth's aggregate gravity upon the moon." In other words we have proved that gravity at the earth's surface and at the moon compared, (distance with distance 60), is inversely as the squares of those distances, ($60^2 : 12$.) In fact, we have shown that the law existing among the planets (as proved from Kepler), does come down (as Newton adds) even from the moon's distance to a comparison with the earth's surface or distance 1. This the Editor himself certifies; and to enable his readers to see for themselves that this is so, perhaps he will print that demonstration which he dropped from my letter, with so full and clear an endorsement.

So that, although the Editor *did seem* to deny this coming down of the law to the earth's surface, (as said above), it now appears that he does not deny even this. In fact, he concedes Newton's general laws (as seen in the above extract), that gravity varies inversely as the square of the distance from any given atom to another atom. He only denies, that the law will apply to an aggregate of atoms, i.e. to a sphere like the earth, as acting upon atoms or small bodies near it. And the sole ground of his denial here, it now appears in his long argument in the March *Microcosm* is, that there is a side-pull of gravity from different parts of the earth upon a small body or point near to it; which side-pull must neutralize a part of the gravity effect, he says "about half" of it, here at the earth's surface,—though not affecting it much at a distance, say as far as the moon. So, that, he argues, the law holding among the planets, can hold also at the moon as compared with the earth's radius; but it is not possible for it to apply near the earth as compared with that same radius of the earth by reason of the differing side-pull.

I think I have now made a fair and clear statement of the Editor's view, and of the very point at issue, as separated from every side question. And how does it leave the matter? The Editor grants that the gravity force at the *earth's surface* may be compared with the gravity force at the *moon*, and is found to be actually 3,600 times as much, that is, just in proportion to the squared-distance-inverse, reckoned from center to surface and from center to the moon, ($\frac{1}{2} : \frac{1}{60}^2$) : as shown in the confessedly "correct mathematical statement" of myself as well as of Newton. And yet, he claims that *it is impossible* for the *earth at its surface* to have thus its full gravity force as it does at the moon, so as to operate by squared-distance-inverse as full gravity acts among the planets; because gravity at the surface *must* have lost half its effect by side-pull, while not thus losing at the moon, so that the ratio between the two *must* be only half what the squared distance proves it actually to be!

Read. "So far from the figures quoted above (3,600-fold) being correct, the weight of a body on the earth is *shown by our diagram* to be only about 1,800 times greater than at the orbit of the moon, instead of 60x60," (March Microcosm, p. 6, 3d col. bot.) Compare this with the previous extract (from the Feb. No.), where he certifies to our 60x60-3,600 ratio as a "correct mathematical statement of the manner in which the moon is kept in its orbit." Query: What place is there for a new ratio 1,800 after we have proved *mathematically and correctly* that the ratio is actually 3,600? What room for a *supposition of necessitated falsity* in a view, after it is already absolutely proved as an undeniable fact?

The Editor repeatedly asserts, that Newton "assumed" or "estimated the weight of the moon by the *apparent and not real* gravity of a body on the earth." On the contrary, Newton, instead of *estimating* an unknown quantity, merely *measured* a visible and evident value. Is not the fall of a body 16 1-12 ft. or 193 in. in a second, a well-known *fact*? Is it not a "real" (rather than merely "apparent" or *reduced*) measure of gravity at the earth's surface? And was it not with this, as a "real" true yardstick, that Newton measured the *fall of the moon* each second from its tangent? And does not that measurement show, that the 193 in. per second of gravity fall here is 3,600 times as much as the gravity fall of the moon per second? It certainly is agreed between us all around, that gravity force at the earth's surface *is actually* 3,600 times greater than that at the moon, instead of being only 1,800 times greater, as it would be if side-pull hindered as the Editor calculates it. There-

fore, the main question is settled: and all that remains is, to see if the *method* of this fact can be *explained*, so as to clear up the *mystery* in regard to side-pull.

How then stands the Editor's argument? It goes thus: The earth *does* act, by full force (of squared distance) at its surface, as found, by comparison with its force at the moon; and yet *it is impossible* for it so to act, because it *must* lose "about half" its effect by its side-pull! The thing *is so* and yet it *cannot be so*!!

ANSWER.—(1) To this the first answer must be quick and short: A positively known fact cannot be overturned by any seeming objection to its possibility. The mistake cannot be in the fact mathematically demonstrated, but must be in the apparent difficulty urged against it. If the divergence of pull did *really seem* to be opposed to the fact of actually squared-distance-inverse, still the evident fact must stand, though with a shade of *mystery* about the *method* of it, as about many other things. Science has its mysteries, as well as religion; and here we *might* rest the case. But no! The ANSWER (2) is our third demonstration of Newton's law; namely:

DEMONSTRATION III. The *seeming objection* does not exist. And this for two reasons. (1) If there be a loss of centerward pull by reason of side-pull, it is *no such amount* of loss as the Editor claims. Instead of being as alleged a loss of "about half" to gravity effect at the surface, seeming to require a reduction of half in the *actually known* ratio to the moon, it cannot be a loss even of *one-seventh*, and therefore cannot (if it exist) affect the gravity law, only as *one of the needful qualifications* belonging to every such law. The Third Law of Kepler has a qualification (or correction of value) for the *mass attracted* as not a single atom (as explained by Herschel, *Outl. Ast.* p. 563, and as given to the just-issued text-book of Mechanics, by Prof. C. J. Remper, of Bethany College, W. Va., a patron of *The Microcosm*.) And this very gravitation law of Newton before us has a qualification on the same account, as well as another qualification for distance taken *below the surface* (or less than 1.) Might it not then have still another qualification for *short distance* from the attracting mass; without thereby breaking down the law itself? The Editor does so treat the matter taking the 3,600-fold ratio as a basis (drawn from Newton's own law,) which he proceeds to *qualify* by reduction of value; only that his qualification is given as *so excessive*, as to seem like a caricature of the case.

Looked at in this light, as a *possible* (but small) qualification of gravity, I myself too many years ago, when I was younger and

greener than now, took up this idea of the Editor (for it is a not-unnatural mistake,) and spent months of careful figuring to make it out. Fortunately, I was not tempted, like the Editor, by frequent call for "copy," to air my crude impressions publicly, before having discovered their fallacy. The full written results of that thorough investigation now before me, enable me to offer help to other erring mortals on the same false scent. One of the first things I examined, was the precise value of this correction, if such there were needed.

The Editor guesses that its effect is to reduce weight at the earth's surface to "about one-half" what it would otherwise be; and much space is occupied in carrying out the startling conclusions that result at different distances, from such large estimates, given (as he concedes) only "as near as we can guess." Now, instead of such "guess-work," my first step was to *calculate*, as exactly as possible, the real value of the discrepancy supposed. And after long critical analysis, by reckoning in different ways the *average of obliquity* and the *average of side-distance* for all the particles of the sphere, I found that, to a body on the earth's surface (where the loss of effect from side-pull would be greatest,) it would be, not "about half" or .5, but .1424 or *less than one seventh* of the whole value.

I have before me the table of *reduced values* at different distances as thus found, the full centerward gravity being 1; giving it as reduced by side-pull 1 radius (or surface) .8576, for 2r. .9576, for 3r. .9704 for 4r. .9889, for 5r. .9928, for 6r. .9964, &c., for 10r. .998713, for 60r. (to the moon) .999950.

I did not for a moment dream, that this small qualification of gravity effect (if real) broke down the whole gravity law, though it might be important *as affecting somewhat the distance and motions of the moon*. So I pressed deeper and deeper into the merits of the supposed discovery, trying to prove mathematically some oversight of Newton in regard to this side-pull—only to demonstrate at last, unexpectedly to myself, that it was all a mistake of my own!

The fact is, as one pushing into the true inwardness of this thing soon finds out, Newton and the other great mathematicians were not so *simple* and so subject to *oversights*, as we are at first tempted to think. They knew a thing or two. They were keen and all-penetrating. No little point that we can catch at was overlooked by them. They have met and conquered almost every difficulty that can be raised. For instance, Newton was not ignorant about "side-draft," a matter that every farmer has to take into account. He ciphered these

things all out; and his demonstrations show, that the *objection before us does not exist*,—be cause:

(2.) The side-pull does not reduce gravity effect below a centerward pull that would otherwise exist; but *it reduces what would otherwise be a surplus force* down just enough to *equal the centerward value*. The divergence of pull to different parts of the globe, instead of opposing the fact of full and exact centerward attraction "at and above the surface," and so of squared-distance-inverse, *is the very circumstance which verifies and ensures that fact*. It is the divergence of pull, and the reduction of gravity effect resulting from it, that makes the whole result, at and above the surface, the same as if the whole globe were concentrated at the center, *instead of being greater than that*, as it would be without that divergence of pull.

Without the divergence of pull, that is, with every particle of matter brought down to the central line, *without change of distance*, from the attracted point at or above the surface, the aggregate attracting force would have *greater* effect than if the whole were concentrated at the center; that is, it would be the same as if the whole were concentrated at a point *nearer* than the center. To make the force balance as if from the center, that very reduction on account of diverging pull has to be made; and thus it is that very supposed objection which alone makes the fact of exact centerward attraction possible! This reduction itself is *a part of Newton's demonstration* (now so criticized as overlooking it!) by which he proves the whole globe to be attracting as if condensed to its center. It is that demonstration, therefore, of Central Force, which removes all *seeming objection* to the fact—otherwise established—of squared-distance-inverse as the law of changing force from the earth's surface to the moon, even as from planet to planet. It is that demonstration of Central Force by Newton, which gives us the Universe bound together under his Universal Gravitation Law.

The *demonstration itself*, with further explanations, under this head III, is reserved to another time.

"KIND WORDS NEVER DIE."

Rev. Mr. Sanders writes:

"I hope God's cause will be furthered by your bold declarations of the truth through the columns of *The Microcosm*. Spread it broad cast over the entire land. May God bless you and your noble band of contributors. The two subjects of the March number, namely, 'Separateness of Soul and Spirit,' and 'Mag-

netism against Materialism,' were to me worth more than the price of the paper. Yesterday I took your paper into my pulpit, showed it to the congregation, and in short told them that its mission was a square fight against all forms of infidelity and materialism on biblical, scientific and philosophical principles. As a result I secured six subscribers in about as many minutes, whose names with the money I inclose herewith.

Yours for the truth,

"F. P. SANDERS.

"Pastor United Brethren Church, Nova, Ohio."

A. H. Byers, of Wooster, O., writes :

"No person with the capacity to read your matchless book ought to be without it, and while I feel that I am doing them the greatest possible kindness in introducing to them this source of true knowledge I hope I am also benefitting you financially. A few years ago I listened to a lecture by Rev. Joseph Cook, said to be in opposition to 'evolution,' but I did not grasp enough of it to be sure of the exact drift of the lecture, and in the hour and a-half that I listened I confess that I got no light. I left the hall much dejected, supposing myself in want of sufficient mental capacity to comprehend the argument. You can therefore judge of my delight, after reading a few chapters of the *Problem of Human Life*, to see the clouds of obscurity vanish, and pure intellectual light stream in like the beams of the mid-day sun, interspersed with flashes of wit and satire as musical as anything in Shakspeare. I am pleased with your proposed change in *The Microcosm* and will remit for the new volume in due time."

Rev. E. G. Brumbaugh, Plainfield, Mich., writes :

"A specimen copy of *The Microcosm* made an unexpected visit to my study by last mail. To-day I did nothing else till I had read it through. At first I thought I would want it, beginning with volume 2; but the more I read it, the more I became interested; so at last I said: *I must have it now and all the back numbers*; so here are 50 cents. I will send the specimen I have to my old college room-mate, preaching in Illinois."

Rev. A. J. Joslyn, Idaho City, I. T., writes :

"Please find inclosed \$1.50 for the present volume of *The Microcosm*, and for the forthcoming volume to begin in August next. I am highly delighted with your paper, I have had your *Problem of Human Life* for more than a year and can indorse all the complimentary notices I have seen of the same, and they are numerous."

Prof. J. A. Goree, Tuscaloosa, Ala. Writes :

"Your book, the *Problem of Human Life* deepens on me every day. Only yesterday, in reply to a question, I told a highly intelligent physician, that so far from my enthusiasm with reference to it declining, it was augmenting, and that I regarded it the greatest book, the Bible alone excepted, that our earth had ever known."

Prof. Henry Richards, Prin. High School, La Belle, Mo., writes :—

"I am reading the *Problem of Human Life*, and consider it the greatest work that has ever been published upon a scientific subject. I wish my students and friends to read it. If you have any special rates to offer students and teachers please let me have them, and I will act as your agent here if you wish. I will do all I can for the diffusion of the principles of truth here made known for the first time in the world's history. Inclosed please find \$6 for list of subscribers for *The Microcosm*."

Prof. W. H. Baker, A. M. (professor of Mathematics and Astronomy, Christian College,) College City, Cal., writes :—

"I have read the *Microcosm* with much interest, and shall endeavor to extend its circulation. I am not yet ready to express an opinion as to the correctness of the theories which it advocates. However, it has already exposed much error, and people will not be so ready to conclude that a thing is true because a great scientist says it is."

Rev. H. Lyman, Cortland, N. Y., writes :—

"The mill chokes. I am in danger of intellectual congestion. Having been in the habit of picking up ideas in my reading sporadically diffused I was not prepared for the concentration of thought that I find in the *Problem of Human Life*. After the Bible, I have no hesitation in saying that for thought,—profound, logical thought,—it has opened to me the richest mental quarry to which I have ever had access. Not a barren page have I yet found."

Prof. J. N. Janeway, Sweetwater, Tenn., writes :—

"We are truly happy here to see announced in the March *Microcosm* that the editor's picture will be given in the first issue of the second volume. We are getting anxious to see 'the man that God made!' I love *The Microcosm* and its editor, and eagerly do I devour the contents of every number as soon as it is received. As long as I keep my senses you may count on me as among your permanent readers."

Rev. Joseph H. Foy, D.D., St. Louis, writes :—

"Your work, my dear Brother, is not more valuable in its exposition of the hollowness and

flimsiness of much that is called science, than in its tendency to weld together by the hammer of common sympathy all who in every place out of true hearts call upon the one God and Father. I meet men, lay and clergy, of every shade of religious thought, who recognize, in your fearless work among the scientists, the first movement of the returning tide that shall forever sweep away the foundations of that arrogant, godless, empirical materialism which has arrayed itself against the spiritual hopes and yearnings of the human race. For generations destructive, aggressive criticism has been employed at the expense of Christianity, and the dearest hopes of man. But 'Wilford' has broken into the mistaken policy of scornful and dignified silence, and shown the opposers of religion that there are blows to be given as well as taken."

John L. Dismukes, M.D., Mayfield, Ky., writes:—

"WILFORD HALL:

"*Dear Sir*: I have all my life wished for a scientific demonstration of the Problem of Life hereafter as well as here, but it never came till a friend placed your book in my hands. That book meets the question fairly and squarely, and men who are inclined to doubt, read it when they can be induced to read no other book. It is sought after here by the thinking classes, and the reasoning is such as to hold them spell-bound till the work is finished. Sir; long after you are dead, men will continue to rise up and call you blessed, and dying bequeath your name to their loved ones as the dearest legacy they can leave."

Mr. T. J. Beck, Tennille, Ga., writes:—

"I propose to take the agency for the sale of your *Problem of Human Life*, though I do so alone for the good I feel sure I will be doing. I consider it the most important human production of this or any other age, and I feel it a duty to aid in making it known. I believe that all lovers of truth should combine and devise means to place that work in every household in this land. It must win its way in time and work a tremendous scientific revolution, but a united effort on the part of friends of Christianity would hasten the utter overthrow of false science and the much firmer foothold of an unshaken faith in God and His work. I shall be delighted to see Wilford's portrait in the first number of the next volume as promised. May God preserve his life for the noble work in which he is engaged."

Prof. John M. Reid, A. B., principal of the Business Institute, Morrill, Kansas, writes:—

"I am one of those obliged to lay aside the old pet theory of acoustics, and to begin my

lessons anew. I am thankful, however, to have lived in this age of advanced thought, and take pleasure in adding my voice to the multitudinous testimonies of those who, like myself, are forced to admit your positions correct. Continue the fight and give no quarter."

Prof. S. Hassel, A. M., president of the Collegiate Institute, Wilson, N. C., writes:—

"It does now really seem that the \$5,000 cash prize offered by Mr. Joseph Goodrich ought to draw out the efforts of some of the advocates of the wave-theory of sound, if there is any truth in that theory. May you be successful in your powerful assaults upon science falsely so-called."

Prof. C. D. Threlkeld, Benton, Ill., writes:—

"I take pleasure in saying that I have finished reading the review of Tyndall, Helmholtz, and Mayer, on Sound, in the *Problem of Human Life*; and I must confess that my interest increases as the square of the number of days I have been reading it. So thoroughly converted am I against the current theory, that I challenged the teachers of this county to defend the undulatory theories of sound and light as taught in our text-books of philosophy. But to my surprise, not a teacher in the County Institute, which has been in session during the present week, was willing to accept the challenge, though it was published in each of the county papers. I send you a list of six subscribers for *The Microcosm*, and will send you another club soon.

C. D. THRELKELD,

Ex. Supt. of Schools."

Rev. Dr. C. W. Camp, Kingston, N. Y., writes:—

"I have read your admirable work, the 'Problem of Human Life,' very carefully, and I must thank you most heartily for having written it. Something of the kind has been mistily floating before my mind for years,—an idea that most scientific theories were baseless and illogical assumptions has persued me; but in a busy parish life in the country, one has not the time to follow out deep trains of thought. Reading your book has revived many old thoughts, and has given me that satisfaction which comes from seeing a nebula come out into clear outlines. Again I thank you for your *telescope*."

MICROCOSMIC DEBRIS.

A VENETIAN glass manufacturer is making a great success of ladies' glass bonnets.

On the lowest computation, 550,000 tons of fish are annually taken in British waters, and Prof. Huxley estimates the take of herrings in the North Sea at 3,000,000,000.

Scattered through the classes in the Wesleyan University are sixteen young women, the standing of every one of whom for scholarship is above the average, while several are close to the top.

The Czar has written to the morgantic widow of his father, who has been residing at Carlsruhe since the death of Alexander II., requesting her to return to Russia, and live in St. Petersburg.

It is remarkable that Bulwer, Dickens, and Thackeray were alike unhappy in marriage. Thackeray's wife was insane nearly all her married life. In all cases the wives survived their husbands.

A rich discovery of Lacustrine relics has been made at Steckhorn, on Lake Constance. They consist of flint and bone implements, pottery, bones of animals now extinct, and a quantity of wheat and oats.

The famous horse-chesnut tree in the Tuilleries Gardens, which is wont to blossom only on the 24th of March, in honor, the loyal used to aver, of the Dauphin's birthday, burst into bloom this year on the 28th of February.

A crow that could speak a dozen words plainly has just died at Bedford Mass. He might have become famous in his lifetime, but for his shocking profanity, which made his seclusion necessary. His early education had been bad.

A sister of Edward Hannegan, once United States Senator and Minister to Russia, died lately in an Indiana poorhouse. She had been reared in luxury, but a complete loss of relatives and property reduced her to pauperism.

Forty thousand acres of land in Arkansas have been secured for an Indian colony. The immigrants are to come from the Tyrol, principally, and will be agriculturists. About a thousand Italians have already settled in that region.

Tom Hughes, it is said, will soon be appointed Governor of the Isle of Man. The Governorship has a good house and a salary of \$7,500 attached to it; the duties are very light, and the cost of living about 30 per cent less than in England.

Mr. Tennyson has just recovered from a sharp attack of gout in the right arm. It is the first time that he has ever suffered from this painful complaint. The poet has completed another play, of which Mr. Irving will have the refusal.

The Lutheran Church, to which Princess Helen, of Waldeck belongs, does not sanction the celebration of marriages between Ash Wednesday and Easter Monday. Hence the

Duke of Albany's marriage could not take place until the last week in April.

The manuscript of Dicken's "Christmas Carol" is now in the hands of a Birmingham bookseller, who offers it for sale. All Dicken's other manuscripts are at South Kingstone, except that of "Our Mutual Friend," which is in the United States.

The Sunday-school teacher who asked a lively little Massachusetts boy the question: "What kind of boys go to heaven?" got an answer, but it was not the one he was looking for. The boy quickly replied, "Dead ones," and the teacher ceased questioning.

Mrs. A. T. Stewart is described as a little old woman who wears a brown wig and showy diamond ear-rings. Her figure is \$25,000,000, and it is asserted that Mr. Stewart's determination that none of his relatives should ever have any of the property will be carried out by her.

Here is a nice little name of a paper for small boys to shout: The *Internationale Kosmopolitische Polyglotte Central Zeitung von Wien*, which is about to be produced in Vienna. This title is to be in twelve languages and dialects, and the vender may take his choice.

Paterson, N. J., is supposed to possess more one-eyed men than any other city in the United States except perhaps Pittsburgh. Nine-tenths of those thus afflicted are workers in iron and steel, and have been struck in the eye with the metal clippings.

There lately died in Paris a remarkable man in the person of Mr. Blindworth, who was called the "Dean of the European Corps of Spies." The son of an English mechanic, who had settled at Gottingen, passed his life as political state spy, and grew rich in the business.

Many years ago the corporation of Edinburgh gave to their then Lord Provost a piece of land forming part of the waste called the borough moor, and then of little value. His descendant, Sir George Warrender, realizes from it an income of nearly \$500,000 a year.

Trustworthy reports from Persia say that the cultivation of the poppy is increasing, and is likely to extend greatly every year. Of course the suppression of the India and China trade in opium, for which the religious world is clamoring in London, would give an immense stimulus to the business in Persia.

There are 900 Wesleyan Methodist churches in the Fiji Islands. Less than a century ago the islanders were considered the most depraved cannibals in the world. There are in all the group eighty islands, and each of even the smallest of these has at least one church, with

a house for the residence of the pastor or missionary.

In 1881 there were 10,076 marriages in this city. One Lutheran minister performed 747 of these. He has for a long time had a great run of marriage business, and has in sixteen years married nearly 5,000 persons. Some have paid substantial wedding fees while others have been content to hand the officiating minister a dollar, or even less.

In Assyria there are sculptures on the ruins of the old palaces, in which the umbrella was borne, in war as in peace, over the heads of the sovereigns, usually by some female slave. From Asia it passed into Africa, as sculptures discovered in Egypt will show. The Byzantine Cæsars, fond of pomp, greatly affected its use. In time it was in the hands of many rich people in Greece and Rome, and has continued as a popular institution in Italy to the present day.

A gentleman possessing immense wealth died the other day at St. Petersburg, and bequeathed the whole of his fortune to Philippopolis, the chief town of Eastern Roumelia, where he was born. The money is to be applied to the foundation of public institutions of general interest, there being at present nothing of the kind in Eastern Roumelia.

Dr. Newman Smyth, who has been elected to the chair of Christian Theology in Andover Theological Seminary, an institution regarded as a bulwark of orthodoxy, is an outspoken disbeliever in the doctrine of endless punishment for the wicked. The selection is yet to be confirmed by the Board of Visitors, whose action is awaited with much interest by all concerned.

A remarkable rough diamond has been lately brought into England from India. It is a pure blue-white stone, weighing sixty-seven carats, in form nearly a drop, and when cut and polished would be about the size of the Sancy diamond. The surface is slightly indented, but there are no marks of cleavage. The value of this precious stone is estimated at \$175,000.

The population of Italy, according to the census returns now being collected, is expected to be somewhat under 29,000,000. The towns in the last ten years have increased far more rapidly than the rural districts. The annual normal increase appears to be a fraction over seven per thousand. All the great cities have increased except Florence.

The architectural arrangements of London theatres appear to have been affected by the æsthetic movement. Mr. Irving has given an æsthetic front to the Lyceum, and the Vaude-

ville has a stained-glass entrance. Even the theatre where Mr. Toole delighted the cockneys rejoices in some of the latest developments of decorative art. After this it must be admitted that Oscar Wilde's efforts have not been in vain.

A prominent New York picture dealer, now in Paris, writes home. "The Paris picture market is at present completely stripped of works of the highest order. I have been here ten days, and I have not seen a single painting by Diaz, Corott, Troyon, Daubigny, Miller, or Russeau equal to those which I have purchased during the last few years. I am told on good authority that possessors of choice pictures will not sell them at any price."

Telegraph and Telephone wires, which obstructed the firemen at the burning of the Potter building, have also made trouble in Sheffield, England. A child was lately burned to death in a fire there, and it appears that the fire escape was stopped three times on its way by coming in contact with the wires. The town Council has ordered the wires to be raised to a height of thirty-five feet from the ground.

There is a great deal of talk in Columbus, Ohio, over a recent marriage. The bridegroom was William D. Pugh, son of a Judge, nephew of a member of Congress, heir to \$250,000, and of very respectable social connections. The bride was Ella Boggs, a dancer in a low concert garden. Pugh knew that he would be ostracized, and so started for New Mexico with his wife, after closing his business affairs, intending never to return.

Canon Knox-Little of Manchester England, is as fond of travelling as he is of preaching. He has now gone on a mission to Australia, similar in its character to that which a few months ago brought him to this country. The call of the church in Hoboken, which was made to him as he was leaving this country, is said to be still open to him. He expects to return here in the early autumn.

Mainly through the efforts of Col. John C. Calhoun, a son of the famous statesman of that name, a stock company is going into cotton culture extensively in Chicot county, Arkansas. The capital is provided by New England men, and amounts to a million dollars. Plantations aggregating 32,000 acres have been purchased, along the route of a projected railroad, and bordering the Mississippi River. Negro labor will be employed at day's wages in cash, and the best machinery will be put in.

Edith Mable, aged 18, held a young people's prayer meeting every Sunday afternoon in the

First Baptist Church of Rockford, Ill. Those gatherings became larger than those which the pastor, Mr. Anderson, drew to hear his sermons, and he announced that no meetings other than those he personally authorized should have the use of the house. But Edith is very popular, and has hired the town hall, with the sanction and support of two of the deacons.

Lucknow, the sporting town of India, finds combats between quails her most popular pastime. A native writer asserts that there is scarcely a rich Mohammedan in the place who does not keep a training establishment. An untrained quail is worth from one to four cents, but when a bird has become a famous fighter, the owner can get \$100 for it any day. Distinguished quails live proudly in gaudily decorated cages, and in the pit evince great valor and dexterity.

The last volume of Kossuth's Memoirs has just appeared. In it he predicts that Hungary will shortly separate herself from Austria, but at the same time expresses his conviction that she cannot exist without extraneous support. This support, he suggests, may be provided by Hungary forming with Roumania, Bulgaria, and Servia a coalition for defence against external foes, each State being free to develop according to its own character and tendencies.

In a recent lecture before the "Civil and Mechanical Engineers' Society," Prof. Kerr said that human beings who work in bad atmosphere often live as long as those under healthier conditions, but at a very low ebb of vitality. When a ventilator was put into a certain vilely ventilated workroom the girls became lively instead of remaining dull, and, like Oliver, "asked for more." Their appetites had so increased that they could do more work, but couldn't live on their wages.

The burial vault of the Brewer family is the oldest in the Allegheny cemetery, near Pittsburgh. When the wealthy Charles Brewer died, some years ago, he ordered in his will that only one more person, after himself, should be buried there. This exception was Miss Hern, a niece. After her death the vault was to be locked and the key thrown into the river. Miss Hern died last week, and the executors of Mr. Brewer have obeyed his injunction as to the key.

Most people have a vague idea of the cost of an European trip and are deterred from venturing upon it lest the outlay should be greater than they can afford. While some may estimate the cost of a four months' tour at \$1,000, it is nevertheless certain that one can get along

comfortably, with care and forethought, with half that sum.

The *Jewish Chronicle* says that the many societies for the colonization of Palestine which exist in Roumania have now taken practical steps toward beginning a well-equipped emigration of settlers with capital from Roumania to Palestine. A movement to the like effect is on foot in Russia. "Our correspondent on the Russian border believes that more than 1,000 Jewish families are prepared to embark in agriculture and manufactures in Palestine."

The Eastern Railway Company of France has just made a new essay in the application of electricity. A train equipped with the most recent and improved electrical apparatus proceeded from Paris to Gnetz. The carriages were connected by electric communications, the brakes acted by electricity, and all the compartments of the thirteen carriages composing the train were lighted by electric lamps. The results of the experiments were completely satisfactory.

The Lake of Constance is so low that steamers cannot reach the port of Romanshorn, and passengers from Lindau have to be landed in small boats. The Rhone was never so low in the memory of man. All the mills on its banks from Geneva to Bellegarde are at a standstill, a circumstance absolutely without precedent. A site in the river selected some time ago by the Geneva municipality for public baths has had to be abandoned because it has become dry land.

The greatest activity prevails throughout the northern part of Spain and at Madrid in connection with the projected tunnel through the Pyrenees, to unite the French and Spanish railway systems. The bill passed by the Cortes, and sanctioned by the King last December, is cordially approved of by the inhabitants of Aragon and Catalonia, who will be the chief gainers by the improved communication with their French neighbors in the southern provinces.

The Burmese burn their dead in all cases except that of infants under twelve years of age, and persons dying violent or sudden deaths. Among the Burmese it is "grander" to be burned than buried. Deaths from natural causes are termed good deaths. Sudden deaths and deaths from epidemics are styled green deaths. The former entitle the deceased to burning; the latter necessitate burial.

An exciting whale hunt is reported from the west coast of the Shetland Islands, where 360 whales have been captured by a fleet of small skiff fishing boats peculiar to these islands. About 400 or 500 whales, known as "bottle

noses," were observed sporting about in Weesdale Bay, and as soon as the news spread every available boat was manned by fishermen, farmers, and crofters, and a general chase commenced, with the result that ultimately 360 were stranded.

The London *Lancet* states that there are no appearances of the eyes worthy of a moment's serious notice in the diagnosis of insanity. The "wildness," "unnatural brightness," "restlessness," "dulness," "vacancy," &c., so frequently mentioned in certificates of insanity, are utterly groundless as evidence of mental unsoundness." The writer adds that "there is incomparably more restlessness, vacuity and the like in the eyes of the sane than in those of the insane."

There can be little doubt that premature burial occasionally takes place in France and Algeria, also in Germany, in consequence of the laws ordaining prompt interment. It is no wonder, therefore, that the following discovery signalled in *L'Electricite* has been received with great satisfaction. According to this journal it has been ascertained that the application of an electric current to the body is a certain test of vitality. Such a test being applied five or six hours after presumed death, the non-contraction of the muscles will prove beyond a doubt that life is extinct.

In Pompeii, recently, a very beautiful fountain was found among the ruins. It is said to surpass in beauty any of the fountains hitherto dug up there. Venus is represented as rising on a shell, with Cupid in her arms. Other spirits of love are seen here and there in the waves, while in the background appears a nereid, or water nymph, near a dolphin, with her arm thrown around the neck of a Cupid. In the foreground, on the shore, are two draped women looking at the merry group in the water.

Chlebowski, a Polish artist, who was for fifteen years employed at the court of the Sultan Abd-ul-Aziz, acquired in that position a fortune, with which after the Sultan's death, he went to the French capital, where he built a splendid residence, furnished in Moorish style. But he did not long enjoy his wealth. Enormous purchases of horses and carriages, and various other eccentricities and extravagances soon gave evidence of mental derangement, making it necessary first to confine him in a madhouse, and afterward to send him to relatives in Warsaw.

German undertakers do not exhibit their wares, as is the custom in America. Coffins are made by them to order when wanted. This custom prevails throughout the European

Continent: it is only in the large cities that any stock of the commodity is kept on hand, and then in an unobtrusive fashion. A few years ago an enterprising undertaker in Basel, Switzerland, started business in the American style and put a couple of small coffins in his window. Crowds gathered to stare at the unwonted sight, and before the end of the week the police gave notice to the shop-keeper that "the unseemly exhibition" must cease.

The American Institute of Christian Philosophy takes time by the forelock in announcing now the arrangements for its summer school, which is to be at Greenwood Lake, N. J., in July. Among the speakers will be Prof. Davis of the University of Virginia, Prof. Ladd of Yale, President Bascom of the Wisconsin University, and Bishop Hurst of the Methodist Episcopal Church. The grounds at Greenwood Lake are being put in thorough order for the assembly, and provided with all the comforts and conveniences needed for the entertainment of a large company.

A Geneva correspondent writes under date March 15: "The winter of 1881-82, if winter it can be called, will long be memorable in the meteorological annals of Switzerland. Alpine districts have enjoyed weather fully as fine as that of an average summer. The present month has, so far, been more like May than March. Since Dec. 23, there have been only three days in this neighborhood on which it has rained; snow there has been none; the meadows are gay with violets and primroses; apricot and peach trees are beginning to bud, and chesnut trees are putting forth their leaves. 'In the memory of man,' says the *Fogl d'Engladina*, 'there has not been such a fine winter in the Engadine,' nor, I may add, in Switzerland."

Banza Mautiko is on the Congo River, in Africa. The missionaries who have labored there are much discouraged by the steadfast refusal of the natives to accept any other religion than that to which they have been accustomed, which is a medley of some of the most stupid beliefs and disgusting rites of heathenism. When these natives are reproved or reasoned with for any of their evil practices, they tell the missionaries "You one kind of men, we another; what is bad for you, good for us." The great difference between their theology and that of the missionaries is that they reject the doctrine of human depravity. They think that they are as good as need be, and that the missionaries cannot make them any better than they are.

The following extract from a Danish paper is curious, if not strictly in accordance with

fact: "The famous New York caterer, Delmonico, recently found himself in an awkward dilemma. His chief revenue is from meals served out of the house. The throngs in the streets interfered with their delivery. Waiters sent out on foot were sure to be run against, and the dishes they carried to be upset. If sent in wagons the frequent street blockades arrested their progress, and the food grew cold before it reached its destination. Delmonico found a way out of the dilemma. He put the dinners in a hearse and formed a funeral procession, before which all other traffic gave way. The meals were then served triumphantly to his hungry patrons."

The telegraph work of England has now been very largely confided to women, and it is calculated that there cannot be less than 700 employed at the Central Office. The staff of the Telegraph Clearing-house Check Branch, which supervises the whole telegraphic work of the Kingdom and acts as a check upon all the clerks in the department, is exclusively composed of women, to whom is also intrusted the entire financial business. Certain branches of the Savings Bank Department are also in their hands, as well as the Dead Letter Office. The number who apply whenever a vacancy occurs is enormous. None of the more important offices have yet been filled by women, which, it is thought, are better officered by thoroughly competent men.

It is thought by some severe critics that ministers are lazy and that they hate work. An Iowa man took a fancy to make an experiment to test the correctness or incorrectness of this idea. He advertised in the papers of Forest City that he would pay \$1 an hour to any and all clergymen who would come and saw wood for him. Nearly all the ministers in the town took him at his word. As he happens to have an immense woodpile as well as plenty of money, he has kept the reverend gentlemen at work to see how long they could stand it. Some of them have worked from four to six hours a day, Sundays excepted. They get their pay regularly, and are free to discuss theology as much as they please while they are at work. The impression now prevails in Forest City that ministers have as much work in them as any other class of men.

Lizzie Marcellus, the circus rider, who was lost with Stowe's show on the burned Mississippi steamer *Golden City*, went off with Dan Rice when only 6 years of age. Dan's circus passed through a rural town near Schenectady, and Lizzie rode a short distance with the clown in his buggy. She was a remarkably pretty and bright child, and on leaving her at her

parent's door he gave the family tickets for that evening's performance. She was infatuated with the circus, and begged to be taken along. Dan and his wife offered to adopt her, and the parents gave her up. She was soon put into training for horseback riding, at which she became expert. At the time of her death, at the age of 22, she owned most of the horses in the Stowe establishment, six cages of wild animals, and \$5,000 worth of dresses and diamonds.

"The petrified skeleton found a few weeks since by Dr. S. A. Wilcox of Taylor county," says the Tallahassee *Land of Flowers*, "is among the most remarkable specimens yet discovered of the huge animals which formerly lived on this continent. It was discovered while digging a canal for a mill, at a depth of about eight feet underground, and was carefully uncovered and lifted from its resting place in as large pieces as the workmen could handle. The monster lay on its right side, with its head bent around to the left, supported by the right foreleg, which was drawn up as a man would place his arm to rest his head on. The left foreleg was stretched out at full length, crossing the right near the ankle. Before moving it the doctor took the dimensions of the skeleton, which he gives as follows:—Length of head, 9 feet; length of neck, 7 feet; length of spine, 27 feet; foreleg, 7 feet."

It is a popular error to suppose that ivy growing on the walls of a house makes it damp. The attachment of ivy to walls, so far from injuring them and causing dampness, is an advantage. If the walls are dry when planted, ivy will keep them so. If damp, as the plant overspreads their surface the dampness will disappear. Where dampness prevails ivy sucks out the moisture, and its foliage will prevent the access of rain to the structure; and thus it is not only a remover, but a preventer of dampness. The only danger attending the planting of ivy on buildings is where fissures occur in the walls, in which case the shoots and roots will enter, and, if left undisturbed, their growth will soon begin to tell upon the building, and will by increase of growth push against the sides of the opening thereby enlarging it, and eventually so weaken the wall as to cause it to fall. Where the wall is sound there is no such danger, for the plant does not make fissures, although quick to discover them.

THE CHRISTIAN STANDARD.

THE scientific editor of the *Standard* replies to our article of last month in a most amiable stickfull. This is a decided improvement, and we will follow the example. He says, when he

makes a mistake he confesses it, and that when we make a blunder we call it a "bait!" That's decidedly good, and so clever that it takes the fight all out of us. We therefore extend the right hand of cordiality and agree never to abuse him again.

"THE OIDAL THEORY."

WE give in another column, from the pen of our esteemed contributor, Prof. Ward, President of the Northern Ohio Collegiate Institute, an interesting paper on the above-named new theory of force and matter. We can see even in this brief outline sparkles of genuine thought. The idea involved under the name "oid" or "oidal force" may be susceptible of great elaboration; and if this first paper does no other good in its series of, possibly no more than, hints, it will doubtless start a train of thought in the reader's mind that will prove anything but superficial.

THAT \$5,000 CASH PRIZE.

MR. JOSEPH GOODRICH, hands us the following note he received from Prof. Benjamin Campbell, Uniontown, Pa.:

"Mr. Joseph Goodrich, My dear sir: Eureka! Prof. Mayer stands forth an eminent example of the effect of two sounds in "interference." Your offer has produced *silence*, notwithstanding the thunder of *The Microcosm*. My decision is that you give the prize to Brother Hall, to aid him in spreading the light.

Yours truly,

BENJAMIN CAMPBELL."

[Mr. Goodrich says he concurs with the above and will do as suggested, if no one else comes forward to claim it; to which the editor, of course, makes no objection].

"WHO MADE GOD?"

BY ELD. THOMAS MUNNELL, A. M.

MR. INGERSOLL has sought to distinguish himself by asking the above question, put by almost every child in the land when first hearing about God from the lips of maternal love—"Who made Him?" He means it for a puzzle, and implies that if we cannot find a Creator of the Creator we ought to turn atheists and reject the doctrine of the First Cause. The principle stated generically is that nothing is to be believed or taught that cannot be comprehended—that a gallon measure should not believe there is an ocean because it cannot contain it, and no one should believe that space is boundless because he cannot see how it could

be fenced in. Feeling that this class of doctors ought to take their own medicine, I propose to apply this principle to certain postulates in their own scientific theories. When Dr. Talmage in several sermons, recently published, was testing the claims of Christianity, and among other witnesses called up Mr. Ingersoll to testify, he found no divine authority recognized by the witness by which he could swear him; so he swore him by the Rings of Saturn, by the Milky Way, and by the Nebular Hypothesis. I will call upon the Nebular Hypothesis, not as an authority to swear by, but as an illustration of the modest demand that everything proposed for our belief must be either comprehended or rejected.

This Hypothesis, with much to commend it to the respectful consideration of Astronomers, involves insolvable mysteries which fairly baffle the understanding of our greatest Scientific thinkers, such as:

1. *The origin* of that hypothetical, unorganized star-dust, extending in every direction from where the sun is to the orbit of the most distant planet or comet in our system.

2. *The origin* of that hypothetical force which started said flake of star dust to revolving and threw off one ring after another out of which our planets and comets were successively formed. Prof. Swallow, of Missouri State University, has already shown that there never could have been such an unorganized field of matter as is claimed, for the properties of matter must have been as old as the matter itself; and whatever forces contributed to the organization of said matter into worlds must have begun to operate the moment matter had an existence. If matter is from everlasting, the forces that produce motion, condensation, form, and heat were from everlasting also. Matter can be no older than the operation of these forces, they being twins from everlasting, and *neither* older than the other. This leaves the conclusion in our hands that there never was such an unorganized flake of dust lying within the plane of the orbits of our planets or anywhere else, *waiting to be moved upon by force*. Such a mass never could have had one moment's rest from perturbation, and since formative action was as old as eternity, there could have been no more a beginning to such action than to force itself. When our materialistic philosophers object to the existence of God as from everlasting, and wisely ask, "Who made Him?" let them take their own medicine and tell us "Who made Star-Dust and Force? which they claim are from everlasting. How much more difficult is it to comprehend an everlasting God than to comprehend an everlasting Force, with everlasting

matter in the star-dust period, and both remaining quiescent?

God may have existed a decillion of centuries or millenniums before He put forth a solitary creative *fiat*, but not so with blind, unintelligent Force with inherent properties that *must act immediately*. Should an apple be instantly created in mid-air one hundred feet from the ground *gravitation would lose no time*. Not a second, nor the thousandth part of a second could elapse between said creation and the operation of Force. But the motion of an undisturbed sheet of Star-Dust requires that Force should have lain idle and inactive in the bosom of matter from everlasting and that some other Force had to come along at last to wake him up and remind him of his duty! After rubbing his eyes and looking around upon all that was before him he concluded to get to work! Who this other Force was that disturbed his repose, or "Who made Him," we do not know. Perhaps the Positivists can tell us. According to the philosophy of materialists themselves, Force must have been idle from all Eternity until he began to revolve the Star-Dust, for admitting that Force, the Cause, preceded Motion, the Effect, only the sixtieth part of a minute, as when steam presses the piston before it moves, it proves that *motion is not* from everlasting, but is a thing of *time*, having had a beginning. But if Force is from Eternity and yet only a second older than Motion we have the figures at last that can measure Eternity, for the simple Algebraic formula—*Time since motion began plus one second=Eternity*,—gives it unmistakably. From this there is no escape, if Motion is a thing of time, and if Force is only a second or a century older than Motion. If materialists dislike to be pushed into such an absurdity as this, let them admit that Force was from everlasting before he began to operate, and they will not be compelled to measure the length of Eternity by any such mathematical formula. But this demand seems a little hard-hearted, we admit, for it only throws them back into their old trouble again about the eternal idleness of Force until some other Force or stimulant roused him to his duty. An intelligent Creator may have reposed in His own uncreated perfections billions of geological ages before He willed any creature into being, and after He had ended he could "rest the seventh day from all His works;" but not so with unintelligent Force—the Force of Gravitation for example, or any other Force—for its properties are inherent and can have no rest either before or after "the worlds were framed." Here we can well afford to leave our philosophers to enjoy their puzzling question after having put their difficulties into the follow-

ing rather aggravating shape; for they must admit:

1. That the life time of Motion comes within less than a minute of being as long as Eternity which therefore is not infinite duration, being composed of two measures of time; or,

2. If this position be not agreed to then Force must have remained inactive from all Eternity until Motion was begun, at which time he began his work, notwithstanding the force of Gravitation and all other natural forces must, in the nature of things, be instantly and unintermittingly at work.

3. The only resort left for those who swear by the Nebular Hypothesis is to assume that Motion, the Effect, is as old as Force, the Cause, which would be a fitting terminus to the wilderness of absurdities attributable to all these Sciences "falsely so-called." If they are not pleased with such an inheritance of philosophical difficulties let them cease to ask "Who made God?" until they can tell *Who made Force*—a question not difficult for us who believe in a God who not only created all matter and force of every kind, but who "upholdeth all things by the Word of His Power."

THE CAUSE OF MATERIAL THINGS.

GOD THE CREATOR.

BY REV. STEPHEN WOOD.

IN a previous number, we stated that "God created all things from himself," and that "the Divine substance is self-existent, or life itself." The apostle John, in his first epistle says: "God is love and he that dwelleth in love dwelleth in God and God in him." If the Divine substance is self-existent and God is life itself, His substance must be in itself love. That love is substantial no one can doubt who accepts the axiom: *ex nihilo nihil fit*, but that it is the sole energy in the universe, may not be readily accepted.

It is at this very point in the investigation that we need to examine closely the ground upon which we are to stand; for unless we find a universal principle pervading Nature, from its highest manifestation to its lowest—an energy that does not exhaust itself by efflux, and one whose steps we may trace into lower degrees—one in which we see the relation between the spiritual cause and the natural effect, and thus examine the law of efflux, by which a substance upon a higher plane flows out and is terminated, limited, or finited upon a lower plane in a substantial form, which is entirely separate and distinct from the generating cause, we have no key to the Divine pro-

cess of creation; but with this key in our hands, accepting the doctrine that "every law of Nature is universal"—that when we have discovered a law, it is of universal application—that "Nature is always like herself" we shall be able to travel from the observed to the unobserved, from the known to the unknown. Now right before us is this key. If we shall be able to detach it from its fastening and get it well in hand many of the occult things of Nature may be disclosed. Love is life; whatever a man's supreme love is such is his life. The life of each animal is but a manifestation of its love; and in whatever form of life we may view this manifestation, we shall find that it universally refers itself to one and the same fountain; and it is this similarity of manifestation that has led investigators to the hasty conclusion that all animals have been produced by generation from the same stock, as it is the most rational argument that has been brought forward in support of the transmutation dogma. It is a fact patent to all, that love is the only energy or source of motion in the mental world; no one makes a full or spontaneous motion until his love moves him; and further, no one moves but from the activities of his love, directly or indirectly. So with the animal creation, no animal moves until his love moves him. But in the physical world heat is the sole energy. The forces of Nature may be many, but they have but one universal cause—heat. As love is life in the mental or spiritual world, so heat is energy in the natural world. All the forces of Nature, however varied in their manifestations, or by whatever name they may be known, refer themselves to one source of energy—the sun. Should these propositions be accepted, we have a key in hand to the universal process of creation. If love is to the spiritual what fire or heat is to the natural world, then love which is spiritual substance, flowing down into Nature, produces heat which is the highest form of natural substance. That the activities of our love raise the temperature of the blood is a fact well known. All mankind recognize this fact in common conversation; as, "a warm or ardent love," "burning zeal," "hot temper," "flaming passion" and a "fiery person." Moses says (Deut. 1, 24): "For the Lord thy God is a consuming fire, even a jealous God." This was said to the Jews on account of their low apprehension of spiritual things—the *effect* was put for the *cause*; or, the natural appearance was presented to them instead of the spiritual reality. Moses spoke to the Jews in natural symbols while the apostle John speaks plainly when he says, God is love. God created all things from the fountain of

His infinite love; not by additions but by formations; not immediately, but through intermediates and by discrete degrees. The Bible teaches that all things were created, formed and made by the Divine wisdom, Logos or word. This Divine wisdom then through and by which the Divine love must act to produce anything, must be the sun of the spiritual world and the source of all spiritual forces, as the natural sun is the source of all natural forces. It was through this spiritual sun, then, that the natural suns were formed; or, the spiritual forces emanating from this spiritual sun, terminated in time and space and the highest form of natural substance—ethereal fire or physical energy was caused and formed. This spiritual sun which is the radiance of the Divine love, is not God, it is a substantial proceeding from Him, but God is within it as its cause or formative energy. Hence, He is called a sun (Psm. 84, 11). This Divine wisdom bears the same relation to the Divine love that man's thoughts bear to his affections; it is the first proceeding, separated by a discrete degree, yet united by influx; man's affections are within his thoughts, and are there first manifested, as a glowing heat is manifested in the light proceeding. The Divine love is the heat of the spiritual world and the Logos or wisdom is the light emanating. There is another universal principle in Nature with which we must make ourselves somewhat familiar, before we shall be able to understand the process of creation; viz: the trinity that exists in all things. Each particular in this trinity is entirely distinct from either of the others; and yet, so essential is each to the whole, that if one were absent the whole disappears. A few examples will illustrate: In the sun the trine are the heat, the light, and the energy, or chemical effects. In the absence of either of these the others would not exist. In each material thing, there is the inmost or substance, the form or quality, and the mass or thing. This trinity exists in all things of necessity, because it exists in God from whom all things are. The trinity in God is love, wisdom and power: in man it is will, thought and act. The Doctrine of Forms will be the subject of the next article.

CONSCIOUSNESS IN SLEEP.

BY REV. THOMAS NIELD.

CONSCIOUSNESS is the ego's cognition of what is real. We use the word *real* because there is a pseudo consciousness that mistakes the unreal for the real. After taking a large dose of quinine, the ego is conscious (?) of hearing the

sea roar, even when the sea is a thousand miles away. The unreal seems real. In such a case, the ego has no cognition of the sea roaring, but only of a physical impression similar to that produced by the wave-thuds of the sea. Then the Judgment pronounces the physical testimony untrustworthy, and the ego is satisfied with the verdict. Similar to this is consciousness in sleep. We seem to be conscious of a thousand realities. But the ego has cognition only of what is real. It knows its own activities, and nothing more. The reason of this will appear as we proceed.

While the conscious entity dwells in the body it acts solely through the body. The brain is the medium of consciousness. Hence, a concussion of the brain, if sufficiently severe, will take away consciousness. If slightly less severe, there will be a glimmering consciousness of the fact of existence. As the brain becomes more normal in its action the Imagination comes into play, then the Memory. But not until the brain has sufficiently recovered to restore the Judgment to its throne among the faculties is the man restored to the full and veritable consciousness. Similar to this is the progress to consciousness in sleep. What in our wakeful hours we call Imagination, in sleep we call Phantasy. It is the Imagination set free from the controlling presence of the Judgment. It may be active while both the Memory and the Judgment are quiescent. Then our dreams are a chaos of fantastic absurdities. Or the Phantasy and the Memory may both be active while the Judgment is quiescent. Then we roam through the fields of childhood, though they are now the heart of a city; we shake hands with the departed; or we meet with friends supposed to be in a far off land when, in fact, they are elsewhere. To say that we are conscious of these things as verities would be a mistake. The ego has cognizance only of these impressions. Let a jar awake the sleeper and, presto! the supposed verities are gone. The reason of this is, that the Judgment awakes and discriminates between the real and the unreal. Thus we see that the veritable consciousness of the ego, beyond the cognition of its own subjective states, is based upon the decisions of the Judgment. The Judgment thus being quiescent in sleep, there can be no veritable consciousness while in that state. Hence, it would be a mistake to suppose that the conscious ego is absent from the body during sleep because it seems to be elsewhere. The following considerations will make this appear obvious.

1. When we dream most we are nearest being awake.

2. In our dreams, we may be in a distant

land or even in heaven. The report of a gun would prove us to be in the body.

3. Strains of music in the room where we are asleep may enter into our dream. Pleasant odors may make our dreams pleasant, foetid odors the reverse. Moreover, the state of the stomach has much to do with our dreams. All of which prove that they have a physical basis and are the result of the brain's activity.

4. There are times in dreaming when a person is about to step from a precipice. He pauses and says, No I won't take the step; for I am only dreaming; and if I do, I shall awake panting with fear. The Judgment at that moment is awaking, and that ends the dream.

5. If the ego were absent from the body, it would still retain its entirety. But we know that the Judgment is absent when we dream. And there can be no conscious ego where the royal faculty is not. Therefore, there is no conscious ego absent from the body.

Here we have an infallible test whether we are at any time asleep and dreaming, or awake and moving in the realm of realities. If the Judgment is present, and the Imagination and Memory are under its control; if we can marshal the events of the past and place them in orderly array before the mind; and if we can sweep the whole horizon of our knowledge of things and verify the present by comparison with the past;—then we are awake. The ego is present. In dreaming, the Judgment is absent, and we cannot do these things. The ego is not where the Phantasy and the Memory say it is.

EXPERIMENTS AND EXPERIMENTERS IN SOUND.

BY CAPT. R. KELSO CARTER, C. E.

As has been remarked Prof. Mayer distinctly states that if a resounding tube be shortened one-half the octave harmonic sound will be heard. In the last article we have seen the startling difference between this statement and experimental facts, and before losing sight of the subject it will be well to consider harmonics a little further. It occurred to me that if a tube of one-half the length required for a C3 fork would give (?) the harmonic octave, a tube of double length ought to faintly sound also, for one such would be, according to the wave-theory, of the proper length to resound to C2; and as C3 is the first harmonic of C2 manifestly the fundamental ought to be heard when the harmonic is sounded. In other words the rule ought to work both ways. I immediately proceeded to try the ex-

periment; and here are the results: I took Mayer's C4 fork using my long resonant tube with water-piston, described in a former article, but I failed to get any sound whatever when the length of the tube corresponded to that for the C3. Allowing the piston to sink however, I soon was rewarded by a sudden swell of sound and found the tube length to be 18.6 inches. Remember I was using a C4 fork whose own length of tube was 5.7 in. At 11.4 inches therefore I ought to have heard C3, but as stated no sound was audible. Now C4 is a harmonic of C3 and next in order as you descend the scale C4, is a harmonic of F. According to Mayer's pitch this F has 176 vibrations, hence, a wave length of $1124 \div 176 = 6.38$ ft. $\div 4 = 19.14$ inches for the proper tube length of this note. My experiment showed 18.6, *the harmonic being too short*. Still I persevered and the next sound occurred at 30.54 inches. Now C4 is a harmonic of A flat, but the proper length for this note should be 31.7 *The harmonic too short again*. The next sound was heard at 45 inches which comes nearest to D below the bass clef, but the proper length here should be 45.56. By these experiments it will be seen that in every case the rule works both ways, but both ways are tremendously against the wave-theory. It seems almost childish to be obliged to go on multiplying facts to this point when to practical constructors of wind instruments the truth has always been known. The fact is that the harmonic is not sounded from a tube one-half length, and the octave in an organ pipe is not one half the length of the one below under the same conditions. It is true that Mayer says at page 123, "organ pipes are merely resonant tubes where columns of air, instead of being vibrated by a tuning fork, are vibrated by wind passing through a mouth piece: hence the following law: *The lengths of organ-pipes are inversely as the number of vibrations which they give in a second.*"

Now very flatly, this is not true. But assertion is no proof. Let us appeal to the men whose life-long study has been to make a practical machine that will certainly do the work expected of it. The writer has some personal experience with the flute, in its old form, and also under its present perfect shape as improved by Boehm. The worthy manufacturer, Mr. A. G. Badger, of 179 Broadway, N. Y., whose experience of thirty-five years, and whose distinguished success entitles him to be heard, thus speaks in his "History of the Flute" as long ago as 1853. "Let us suppose a tube without finger holes, which when sounded will give the note C. If this tube be now shortened by cutting off about an inch

and a-quarter from the open end the sound given will be C sharp. If another of the same length be cut off the sound produced will be D. Proceeding in this manner, *with a slight diminution of distance as the tube is shortened*, fourteen or fifteen semitones will be elicited."

He then proceeds to state the prime difficulty in the old German flute—that of being obliged to bore the holes at improper distances, and then shows the superiority in this particular of the improved Boehm instrument, whose holes are all of the same size and succeed each other with perfect regularity, but whose diminishing distance apart is plainly perceptible to the eye. Now here is a practical man who tells us, without ever dreaming that he was running counter to the wave-theory, that a tube of one-half length will prove too long to produce the octave note; it must be shortened. Yet the flute is essentially an organ-pipe, and Prof. Alfred M. Mayer, (et al) says that "The lengths of organ-pipes are inversely as the numbers of vibrations which they give in a second." In order that no doubt might be able to lift its head, the writer entered into correspondence with the famous organ-builders of Boston, Mass., Messrs. Hook and Hastings, whose magnificent instruments are certainly unsurpassed in the world for perfection of construction in every detail. These gentlemen most courteously and kindly responded, giving the subject the most careful attention and recording all measurements with scrupulous accuracy. On January 23, 1882, they sent me the following forcible facts:

An open Diapason, a Gamba and a Quintadema were measured with the following results. The numbers in brackets are the lengths according to wave-theory.

		ft.	in.	
Open Diapason,	C2	3.	81-8.	
	C3	1.	10 1-16	(1.10 1-16)*
	C4	.	10 13-16	(.11 1-32)
Gamba,	C2	3.	10 1-8.	
	C3	1.	10 9-16	(1.11 1-16)
	C4	.	11 1-8.	(.11 9-32)
Quintadema,	C2	1.	9 7-8.	
	C3	.	10 15-16	(.10 15-16)*
	C4	.	5 3-16	(.5 15-32)

The first two are open pipes, and the last closed. Accompanying the above were these words—*A closed pipe of $\frac{1}{2}$ the length of an open one will not give the same pitch.*

The open pipe cut off one half its length will not give exactly the octave of the note previously given. It will be a little sharper.

This certainly is conclusive and will prove an unwholesome pill for the wave-theorists to swallow. But some handy arithmatician will be sure to pounce upon the figures given above

and ask how it happens that the open Diapason C3 is exactly one-half C2, and the Quintadema C3 is just one-half the C2. Messrs. Hook and Hastings reply to this as follows :

"The open Diapason at C3 is just one-half the one at C2, which we account for in the fact that its tone being largely fundamental, having but little of the harmonic quality, practice and theory come out alike." (I will simply call attention here to the fact that the presence of the harmonic quality in a note an octave higher is by H & H held as requiring a shorter tube than one-half, just as my experiments proved, Prof. Mayer to the contrary notwithstanding.) Again, Messrs Hook & Hastings say in reference to these two cases marked with a star, where the wave-theory seems to be corroborated :

"We account for the result in the fact that the *higher note has an increased proportional diameter*. In our ordinary work the diameter decreases one-half itself at the seventeenth note, *while the length decreases one-half of itself at every twelfth note.*" * * * "Without question, the treatment we give in 'voicing,' or producing the requisite quality of tone, interferes with the theory of pitch"

This testimony will certainly establish one thing, viz: that something else besides mere length is to be considered in determining pitch, and that if diameters remain the same the lengths will not be inversely as the number of vibrations in a second. But here is the most absolute proof that practice and theory do not come out alike.

Everyone knows Koenig the great French acoustician. I measured with great care a number of his best organ pipes, prepared especially for illustrations in sound, and found a C3 pipe of 256 vibrations was 22 3-8 inches long, while the C4, an octave higher, was 10 7-8 inches only, or about one-half an inch too short for the wave-theory. Again I measured an open G pipe—14 3-8 inches and a closed one giving precisely the same note—7 in. Yet Koenig says in his catalogue :

"In similar volumes of air vibrations are in inverse ratio to homologous dimensions;" while the fact stares us in the face that his own work directly stultifies his written theory.

More of this again, and still worse for the wave-theory.

PA. MIL. ACAD., May, 1882.

A NEW LAW OF STRING-VIBRATION.

WE give the following letter of the Rev. Mr. Wells for the purpose of presenting what we are forced to regard as a new law in the vibration or tensioned strings, though it conflicts with our own published views upon the sub-

ject. We find that like other investigators we are apt to take for granted received views of science, and in spite of ourself to fall into old ruts without calling scrupulously in question everything not absolutely demonstrated as science. We submit Mr. Wells' entire letter to the consideration of the reader, though much of it refers to other matters. The writer undoubtedly is a careful scientific thinker, and evidently knows what he is talking about. The following is his letter :

EDITOR OF THE "MICROCOSM":—Some time last spring I read a timid notice of the "Problem of Human Life" in a prominent religious weekly, which induced me to send for a copy of the work. I read it with increasing astonishment and delight. Even the third reading of it has only increased my estimate of its value. After having become sufficiently acquainted with its contents to form, as I thought, the basis of a just judgment of the merits of the work, I prepared a notice of it for publication in the paper which called my attention to it, commending the book in such terms as I thought its superior merits demanded. In this notice I especially called the attention of the clergy to the work, recommending it as worthy of their careful study. But my well meant efforts were all in vain; the production never appeared, notwithstanding I have been an occasional correspondent for many years. I am a very interested reader of the "Microcosm;" it is just what I have been wanting to see these many years. I am highly pleased with the promise of enlargement. When you promised to demonstrate that the great Newton was in error in his *Principia* Prop. 75, many felt toward you much as Christ's brethren felt toward him. They thought you were beside yourself; but you have fully redeemed your pledge, as I conceive. I am a member of the Iowa Conference of the M. E. Church. Not long ago a brother preacher called at my house to chat a while. He found me writing an order for the "Microcosm." I had just been reading the "Problem of Human Life," and it lay on the table before me. I took it in my hand and said, This is the grandest book of the age. After having given a brief outline of its contents, my friend, who by the way is a graduate of the Iowa State University, said, "that book is unscientific, for it is contrary to the highest scientific authority of the age." In reply, I said, do not condemn the work until you have carefully read it; then, if I am not mistaken in my estimate of your capacity, I think you will change your mind. His reply was, "I would not read such a book; it would be but a waste of time." Well this was a stunner! but after

quoting Prov. 18, 13, I said, as gently as circumstances would admit, Your conduct accounts for the fact that there are so many bigots among the so-called educated classes.

Present indications are, that unless these would-be leaders of Religious and Scientific thought shall by the law of the "survival of the fittest" fall into line with the "new departure," they will be left embedded in the debris of the past, as specimens of a fossilized species.

Now while I think of it, I wish to call your attention to the 97th page of the "Problem of Human Life" the 19th line from the bottom of right hand column, where, if I understand you, you teach that a string, such as that of a violin, is governed in its vibrations by the same law that governs the movements of a pendulum. You say, "after being relieved from the rosined hair, it at first starts back slowly, moving faster and faster, the same as a pendulum, till it reaches the center of its amplitude and accomplishes one-half of its swing, from which point it moves on by its acquired momentum, through the other half of its journey, swiftest as it leaves the center till it reaches the other limit of its swing," &c. Now it seems to me (it may be due to my obtuseness), that your philosophy is at fault here. Of course you are aware that the motion of a pendulum is caused by the attraction of gravitation, and that its motion is accelerated toward the center of its amplitude for the same reason that the motion of any falling body is accelerated as it moves toward the earth. But the motion of a string, "when drawn aside and released," is not caused by gravitation, but is the effect of the elasticity of the string, or of the object to which it is fastened. Put your finger against a string, thus strained, and move it from its center. The force by which the string is moved aside must be increased in proportion to the distance the string is moved from its center. So far all is clear. The string is evidently at its greatest tension or rigidity when drawn farthest from the center. Now let go the string. What makes it fly back? Plainly to release itself of this increased strain on its elasticity. Hence, as the strain on the string is greatest when drawn farthest from the center, it seems self-evident that its motion back toward the center will be greatest when the force which moves it is greatest. And as the tension of the string lessens as it moves toward the center, the rapidity of its movement must necessarily diminish in proportion. Then it follows that the law governing the vibration of a violin string is not the same as that which governs the movement of a pendulum. Which of us is right? I wish to be right even in small things.

Yours truly,

N. WELLS.

PROBLEM OF INFIDELITY.

BY REV. WM. ALLAN.

WE call this a problem because the infidel state of the mind is not only unbecoming, but unnatural. I think we are furnished with sufficient data for the solution. Man is characterized with recklessness when circumstances are favorable. So far as we are capable of researches he is the most enigmatical of the whole creation. The problem of his nature has never been solved outside the teachings of the Bible. He is an automaton more of circumstance than of sober reason. When set agoing, whether right or wrong, his nature is to hurry up to break-neck speed. He will hear no reason only that which fortifies him in his previously conceived opinions. In his reckless spirit he trifles with life here—he trifles with his eternal destiny.

Some men grow up infidel because they have no other training. They are like domestic plants left neglected on the common. The circumstance of bad association has done its evil work upon both mind and heart. Some are only professed infidel. They had rather not be. They are simply unfortunate. Some circumstance started them that way in an evil hour. Yet they lack courage to renounce. They live a wretched life—being full of doubt and fear. Some become infidel through policy. Perhaps Mr. Miln, of Chicago, belongs to this class. He was once a Congregational Minister, then Unitarian, and now, finally, worse than nothing. But the Editor of the Microcosm put him under review in the April number. Some again, become infidel through a chronic habit of reviewing the conduct and life of a few wayward Christians; as though every Christian is a defaulter, rogue or swindler. Nothing is more illogical or extremely foolish. They forget to judge of Christianity by its general fruits, or by the principles the Bible teaches. Their logic is bad, for they find their ruling out of an exception. But to lay aside further notice of these classes, and to look at the subject philosophically, we assume that the first general step toward becoming infidel lies in the fact that man fails to see his own weakness. What is man? Why should he boast? I must confess, after much study, that I can see little, and but little more in man than this; *he invents by accident and profits by experience*. In order that man may see his weakness illustrated, let him in a leisure moment divide the number 10 by 3 and express the result decimally. In the operation he will find himself continually approximating the true result but never getting nearer a finality.

Though he continue the division a thousand years yet he cannot say he is nearer a finality than when he first began. The most he can say is, "I am approximating the true result." Can man explain how he can continually approach and yet never get nearer the point of approximation! What is the matter then with even *this* little problem? We answer just that which is the matter with all infinity. It is perfectly incomprehensible to a material being, or to the spirit, otherwise intelligent, that is forced to operate through material organs. It is enough to illustrate man's weakness. There are a thousand things he cannot grasp. There are problems he will never solve. His spirit is compelled to work through a veil of dull mortality. He is under the law of mental limitation which he can never transcend. As he who undertakes too much physically, pays the tribute of a paralyzed muscle or of a broken bone, so he who undertakes too much mentally, breaks the equipoise of a well-balanced mind and indulges the wildest vagaries of unbelief.

But when a man cannot see his weakness he soon runs into self-laudation. The *ego* becomes very prominent. He exalts the creature and degrades the Creator. He loses sight of everything except the idol of his heart—the *ego*. He forgets that "when a man seemeth to know anything he knoweth nothing yet as he ought to know." That no man should think more highly of himself than is becoming. Yes, an unconsciousness of human weakness is the hot-bed, the fruitful source of arrogance and self-exaltation. All infidels are arrogant boasters. Herein lies the substratum of all infidelity. This spirit obtained in Nebuchadnezzar, King of Babylon, whose name I shall follow with a quotation; "Is not this great Babylon, that I have built for the house of the Kingdom, by the might of my power, and for the honor of my majesty." A deeper touch of arrogance and more infidel speech is not to be found on record. I have no time to note here what followed. There is not a scintillation of humility in all this speech, in the old Babylonian King.

Now try any system of infidelity. Evolution for instance, and we see the same arrogance, the same unconsciousness of human weakness, the same self exaltation of the creature at the expense of the Creator the same boastful spirit, the same *ego* which is worshipped. Now hear the infidel Evolutionest, for he is in strong imitation of Nebuchadnezzar. "Is not man, such as I am a noble creature and worthy the greatest praise, who in his desperate struggle to survive, has at last by gradual steps evolved from an irrational jelly-like primordial cell? Has he not displayed a wonder-

ful energy, and made more than a thousand beautiful *hits* in natural selection? And see the palaces, cities, bridges, tunnels, telegraphs and railroads he has built for his own honor and glory." This is infidelity not simply after the order of Nebuchadnezzar, but it is the natural fruit of Evolution.

"COLOR-HEARING," AND SEPARATE SOUNDS ON THE SAME WIRE.

BY PROF. I. L. KEPHART, A. M.

UNDER the head of "Color-hearing," there appears in Stoddard's Review for April, 1882, a statement of more than ordinary interest. The phenomenon referred to, would at any time attract attention, but most especially does it do so just now when the wave-theory of sound is writhing in its death agonies, under the terrible blows dealt it in the *Problem of Human Life* and in *The Microcosm*. The Review says:

"Color-hearing is an expression that has been applied to a phenomenon of which some few people are conscious—viz., an appearance of certain colors accompanying the perception of notes or noise. In 1873, Nussbaumer described (in a Vienna medical paper) this double perception, as he and his brother had it, and Herren Bleuler and Lehmann, in Zurich, have recently made a more systematic study of the subject. The colors associated with particular notes, differ in different individuals. As a rule, the higher notes are accompanied by lighter colors, the lower by darker. Cords either cause the colors which correspond to their notes to appear side by side, or give a mixture of those colors. A thorough musician who was examined, perceived a distinct color with each key—e. g. C major, gray; G flat major, reddish-brown; A major, blue; A minor, lead-color; F sharp major, yellow; and so on. The same note in different keys, changes in color according to the color of the key in which it is found. To many persons, too, the same piece played by different instruments appears in different colors. Noises, again, are generally accompanied with colors, these being generally of a gray or brown hue. Increased intensity of sound affects the color perceived, and more so in the case of noise than in that of musical notes; in the latter the intensity of color is increased; in the former a transparent effect observed gives way in some measure to opacity. In color-hearing no essential difference between the two sexes has been demonstrated. Of 76 'color hearers,' 59 per cent. were males, and 41 per cent. females. The percentage of 'color hearers' in 596 individuals examined was only 1.25. The phenomenon is to a great degree hereditary."

From the above, it appears that "color-hearing" is an established *fact*, but only certain individuals have the faculty to discern it. This latter fact, however, is not strange, because it has long since been indisputably established that there is such a thing as color-blindness—

that of the seven primary colors, there are persons who can only perceive two or three. The colors are all there, but the man who is "color-blind," cannot perceive them—his faculty of vision is deficient. So it seems to be a fact established, that all sounds produce color, but only a small per cent. of human beings have the visual power to perceive it!

Again, upon what principles of Acoustics and Optics do the adherents to the wave-theory of Sound explain "color-hearing?" We can readily conceive how this phenomenon can be accounted for upon the corpuscular theory of Sound. As the rain and mist will separate white light into its primary colors, so Sound corpuscles may do the same thing, to such a degree at least, as to render the prismatic analysis perceptible to those possessing extraordinary acuteness of vision. But if we adhere to the wave-theory, how are we to account for the fact that no motion or waves of the air produce color, except the "sound-waves"? Or, how are we to explain the phenomenon at all so as to harmonize it with the wave-theory?

Another fact recently discovered which seems irreconcilable with the "wave-theory," is the possibility of sending "*Separate Sounds on One Wire*." M. Maiche has found by experiment that sounds of different characters produced from two separate sources can be sent simultaneously *on one wire* and received separately. He used at the receiving-station two telephones of different resistances, and at the transmitting-station caused a musical-box to be set going on a Microphone of a small resistance, while an induction telephone transmitter was spoken into at the same time. The musical sounds were reproduced in the telephone which had the least resistance, and the vocal sounds in the other, so that with the two telephones to the ears, the music could be heard by one ear and the speech by the other.

Now, to observers and thinkers, this is not only a wonderful and highly interesting discovery; but it at once suggests the question,—How can all this be harmonized with the wave-theory of Sound? How can these distinct and radically different little "waves" pass through the same wire at exactly the same time, without intermingling so as to destroy their distinctness? May we not believe that other and still more wonderful discoveries, in the near future, will throw more light upon this subject, and aid in forcing the Professors of physical Science who adhere so tenaciously to old theories in spite of the absurdities they involve, to lay aside their prejudices, do their own thinking instead of blindly adhering to what the text-books say, and step up from and out of the old ruts?

CONDENSATION AND RAREFACTION.

PROF. T. J. MAHONEY, County Superintendent of Schools, at Guthrie Centre, Iowa, writes that he comprehends our explanation of the manner in which water-waves, started by dropping a pebble into a still pond, will travel by the subsequent action of gravity in pulling down one ridge of water and thus pressing up another, then pulling it down and pressing up another, and so on for a great distance around the centre. But he asks: "May not the expansive quality of the air act in a similar manner to gravity in carrying forward air-waves after they have been started by the sounding instrument, without necessarily attributing all this condensation and rarefaction to the mechanical force of vibration that starts these waves?"

We made this matter, as we thought and still think, perfectly plain in our replies to Professors Reppert and Humphreys, in the November and December numbers of *The Microcosm*. Here is a brief extract from our reply to Prof. Humphreys, in the December number:

"Now it is a fact, as a moment's reflection will assure us, that gravity cannot come into play in the case of these so-called air-waves which are supposed to constitute sound; for the very essence of the wave-theory is, as every tyro in natural philosophy understands, that the supposed sound-waves consist of *condensations* of the air-particles which act like so many *elastic springs*. The theory plainly teaches that the compressing of one of these air-springs causes it to impinge upon and compress the next one; this bears against the next and squeezes it together, and in this manner generates the *heat* required by the theory, and so on squeezing and compressing as far as any sound is heard. I thus try to make this matter plain, to show that gravity has nothing to do in the case of these supposed air-waves, but that, on the contrary, as every writer on sound teaches, they are a succession of elastic springs bearing against each other, and that each derives its motion from the impulse communicated to it by the spring preceding it, and all from the first spring compressed. Suppose, now, a thousand spiral springs to be arranged in a row, each bearing against its fellows; and then suppose that I give the first spring in the row a push, and by the strength of my hand compress it, and that this spring bears against and compresses the next, it the next, and so on to the end of the row, is it not plain that the last spring in the row depends just as much upon my strength for its compression and motion as did the first spring touched by my hand?"

It must therefore be clear to Prof. Mahoney that nothing in the way of elastic force can come out of the assumed air-waves of sound which is not put into them in the original compression caused by the mechanical energy of the vibrating instrument. Suppose you push a piston six inches into one end of a tube a mile.

long, and thus force out a corresponding quantity of air from the other end. The supposition of Prof. Mahoney implies that you only disturb the six inches of air next to the piston, and that the air at the far end of the tube is moved alone by "the expansive quality of the air." Whereas it is manifest that although the air at the far end of the tube was pushed out by the reactive or expansive force of a mile of air behind it, yet that disturbance depended just as much upon the moving energy of the piston a mile away, as did the disturbance of the six inches of air in immediate contact with the piston. The wave-theory dies hard, but die it must. Advocates of the theory would be glad to invent some way to explain how a trifling insect can start air-waves with its almost infinitesimal strength that will churn, compress and rarify four cubic miles of air 440 times a second with energy sufficient to generate the heat calculated by Laplace—by which to add 174 feet a second to the velocity of its sound. But their efforts thus far have come to naught. Prof. Humphreys could only explain this by concluding that a "wave once started *moves of itself*." Prof. Reppert concluded, like Prof. Helmholtz, that air-waves moved "precisely similar" to water-waves, thus overlooking the action of gravity in the premises. Prof. Mahoney thinks that the "expansive quality of the air" does the work, not thinking that a spring has no expansive force whatever, except that which is first put into it by an exact equivalent of mechanical energy. Why does not Prof. Mayer try his hand? Truth is, as fast as scientists become logicians, just so fast will they drop off one by one from the wave-theory of sound as the banner absurdity of the age.

HYDRAULIC PRESSURE.

PRESIDENT C. G. KEPHART, of Avalon College, Mo., copies into the *Avalon Aurora*, our article on the above named subject from the April *Microcosm*, in reply to his questions sent to us. The reader will recollect that we explained, or tried to explain, the principle upon which a column of water or a plunger exerts its pressure in all directions upon the inner surface of a closed tank, as that of the mechanical wedge—the water itself in falling through the column-pipe acting between the already contained water and the sides of the tank like a frictionless wedge, which is but one form of leverage. Or, which is the same thing, the falling water wedges itself between the particles of water already filling the tank, thus penetrating its myriad interstices, and in this manner forces the water outward in all directions to the full equivalent of the mechanical

force exerted by the column through its opening into the tank.

President Kephart says: "We are in no way able to divine how the theory of the *wedge* can apply here at all. We are very much inclined to believe that the effect produced is *to be accounted for in the manner usually done by philosophers, that is, that pressure on a liquid is transmitted equally in all directions*"! That is to say: President Kephart is "very much inclined to believe" that it is so because it is so, without any kind of explanation as to *how* this observed pressure in all directions is "transmitted!" He rejects our explanation—the only instance, as far as we know, in which a mechanical explanation has ever been given—and prefers to *account for the transmission of the pressure equally in every direction*, "in the manner usually done by philosophers," namely, "that pressure on a liquid is *transmitted equally in every direction*!" But *how* is it transmitted? That is the very question he propounded to us and the one we tried to answer by the mechanical principle of a frictionless wedge. President Kephart rejects our proffered service, and prefers to believe, with all great philosophers, that the pressure is transmitted equally in every direction because pressure on a liquid is transmitted equally in every direction! If the students of Avalon College prefer the explanation (!) of their president to the one we have given, so mote it be?

But President Kephart supposes a hollow sphere and a column of water entering it through an orifice, and then wants to know how a wedge can be driven around such an inner surface so as to act in all directions; and concludes that our wedge must act as no other wedge ever acted! The trouble lies in his supposing only *one single wedge*. But we wish him to suppose that every separate molecule of the water pressed against by the entering column or the plunger is converted into a wedge; that these press against other similar wedges; and that more than ten thousand million frictionless wedges are at work in a single barrel of liquid, under pressure of an entering column, and that in this manner the pressure is transmitted in all directions, though the column be no more than the small fraction of an inch in diameter. Is not this better than no explanation at all, such as that given by President Kephart and all philosophers?

Finally the President wishes to know if the theory of the wedge explains the transmission of pressure in a closed tank, why it does not also explain how a pebble lifts the entire ocean by sinking into it? We answer that the fact of the lifting of the ocean does not exist, and

therefore does not need an explanation by a wedge or anything else.

If the ocean were entirely enclosed and under pressure from a column of water, then the wedge principle would be appropos. But if the President of Avalon College really can see no difference between the sinking of a block of lead into an open tank (in which its bulk of displaced water is spread out over the surface by gravity) and the pressure of the same weight of lead upon the same water in a perfectly closed tank, where no such surface layer can be spread out, then we confess that we lose all heart in trying further to enlighten him.

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"SOMETHING NEW IN PENDULOSITY."

In the February *Microcosm* we gave Prof. Kirby's arguments against the received view, viz.: that a pendulum or vibrating string rests for a brief period at the end of each swing before commencing to return. We confessed our inability to answer his arguments. We have received two dozen or more letters reproving us for surrendering so hastily. We give herewith a sample of these reproofs from the pen of Mr. Moore :

Hunt's Station, Tenn.

MR. A. WILFORD HALL,

ED. LITERARY MICROCOSM.

DEAR SIR:—Your presentation of the arguments and illustrations of John A. Kirby, of Flat Creek, Tenn., on pendulosity, in your Feb. Number, with your concessions and deductions, has been very carefully considered.

It is manly to surrender under certain circumstances, but unfortunate if only to a glittering display of spiked artillery.

With your permission, I propose to show that Prof. Kirby's arguments and illustrations are erroneous, and that your partial surrender was premature. I quote :

"Suppose, he suggests, that two bodies, one small and the other large, are moving slowly toward each other, and meet without compression or indentation and that the smaller turns back by the contact with the larger, and moves with it without the larger one stopping, can there, by any possibility, be a period of rest even infinitesimally short, in the smaller body?"

"The same thing he illustrates by a pitman saw, where there is no play at all in the journals or joints. How, he asks, can the saw, when it reaches the extreme of its upward motion, rest, if there be no stoppage in the wheel that moves the pitman?"

Now think of the expressions "*without compression or indentation*," and of "*a pitman saw (running) where there is no play at all in the journal or joints.*"

Prof. Kirby thus begs the question at issue,

by assuming that the two bodies are non-elastic, and that the pitman saw is to run with solid joints, and without elasticity or tortion.

In his scientific arguments and illustrations, he evidently denudes matter of one of its essential attributes, and gives it an abstract status, and then searches for the physical law that attaches to it. In this he transcends the limits of scientific investigation, for the reason that matter should be considered just as it is, and not in some supposed impossible condition, in order to discover the laws that control it. He puts his two bodies, and his pitman saw, beyond human experience and observation when he strips them of their essential attributes.

Physical Science is not based on hypothetical grounds, neither can it be, unless the hypothesis conforms to experimental truth. Prof. Kirby's arguments and illustrations amount only to a supposed anomaly in Nature, from which no reliable deductions can come.

I hope he will experiment with matter just as it is, in order to find the laws that control it. Lethim take his two bodies with their properties, and note the result of their contact, and his pitman saw, with such joints and material as can be made available, and if he finds *no rest at all*, I will gladly surrender and hail him as a benefactor. If however, he fails, as I feel confident he will, I then propose to demonstrate the *rest* theory on principles recognized in such investigations.

Very truly,

HORATIO R. MOORE.

Now we admit the force of Mr. Moore's reasoning, and yet there are considerations in favor of Prof. Kirby's views that are difficult to explain away. We presented, in a letter to Prof. Kirby, the same objections as above, and insisted that in the two bodies meeting there must be some small indentation of the larger body, which compression represents the period of rest in the smaller body before turning to go the other way. But he replied as follows :

"Suppose the larger body to be a prodigious *diamond*, which, as well known, can be pressed into solid steel till it is buried, without perceptible compression of the surface of the diamond. Then suppose the smaller body to be a cork ball. On collision with the diamond, it matters not how much the cork is compressed so long as there is no compression of the diamond, it cannot rest, because that part of the cork first in contact with the diamond evidently turns and goes the other way without rest unless the diamond itself is actually compressed by the contact of the *cork ball*. To assume that the cork ball indents the diamond to any degree whatever is to assume that which is absolutely inconceivable, and contrary to all experience. Hence I assume that any period of rest at all to the portion of the cork first in contact with the diamond is inconceivable, and consequently does not occur."

This argument, we confess, demoralized us somewhat, and hence our concession complained of by so many correspondents. But here comes Prof. Reagor, a neighbor of Prof. Kirby, with what may be called a stunner on the other side. He says.

"I will now adduce an argument to show that the pendulum ball *does* come to rest at the end of each swing. It will be conceded that if two equal and opposing forces are brought to bear on a body it will remain at rest as long as the forces remain equal. As the pendulum ball swings from the centre upward there are manifestly two forces acting upon it—the momentum force pressing it upward, and the force of gravity pulling it downward. Now there is a time when these two opposing forces become equal—when one is not pulling it down any more than the other is forcing it up. The time may be very short—so short that it is impossible for the human mind to comprehend it. Yet that is no reason why the period of time does not occur. To say there is no such period, is to say that there is no time when the two forces become exactly equal, which is absurd. Hence there must be a period of rest, however short it may be."

Well, we now confess that we hardly know what to say. We are about as badly puzzled as was the distinguished Squire Duzenberry, who decided that each opposing counsel had gained his case, and that the Constable should pay the costs! If any scientific reader of *The Microcosm* can untangle this enigma in a few simple paragraphs we shall be only too glad to print it. But don't write unless you have something new and to the point to communicate.

SPECIMEN LETTER.

WE expect to present in each number of *The Microcosm*, a brief "specimen letter" from some prominent man with reference to the work being done both by the *The Problem of Human Life* and by this journal, in order that others, who have not the time to read it thoroughly, may profit thereby. We gave last month the letter of Rev. Dr. Fulton, of Pittston, Pa. Below will be found one from the Rev. B. F. Tefft, D.D., LL.D., a quite prominent writer and author, and consequently one who has a right to express an opinion on such subjects.

East Poland, Me., April 10, 1882.

WILFORD HALL ESQ.:

Dear Sir:—Some four months ago I received two numbers of your "*Microcosm*," and I therein found such a notice of your "*Problem of Human Life*," that I was constrained to send for it. The reading gave me abundant satisfaction.

Since leaving college, forty-seven years ago, I have paid little attention, comparatively, to physical science; for, if I may speak after the

Aristotelian manner, my studies have been more *metaphysical* than *physical*; and I consequently am inclined to be rather modest in my judgments in the department of material knowledge. Still, so far as I am able to see the force of an argument based on demonstrated facts, I must say, that you have not only demolished the wave-theory of sound, but have totally overturned the Darwinian theory of Development, besides silencing those hitherto triumphant men, Tyndall, Huxley, Helmholtz, Haeckel, and the rest, who, though somewhat departing from their master, have mainly built upon him. So far, in my opinion, your triumph is complete; and it is folly for any one to say that their silence is the silence of contempt. The ability you have shown is by no means contemptible; and Tyndall in particular, will some day wake up to realize his mistake. That dodge will not succeed. Some or all of these men must come forth and answer you, or, metaphorically speaking, lose their heads. Their headship is already taken from them; and the reading public is rapidly coming to the point of putting yourself into the vacant place. I am almost daily looking to see an announcement, in some of our journals, of a "*Reply to the Problem of Human Life*;" and I am anxious to notice such a statement. If it does not come within another year, it will never come; and in that case, materialism, in this country at least, will be as dead as Julius Caesar.

I have recommended your work to many first-class citizens; and it is being read with care in this section by those whose verdict will possess scientific value.

I am very truly yours,

B. F. TEFFT.

THE "INCORPOREAL ORGANISM."

Editor of the *Microcosm*:

At page 461 of the *Problem of Human Life* you give as an argument in favor of the existence of an incorporeal and invisible organism in all animate beings, the fact that the *nais* (a certain worm) can be cut up into many segments, and that each segment will reproduce by growth the complete worm.

You also adduce the fact that if the leg of a salamander be amputated a new leg will grow out from the stump, perfect in all respects as the former leg, &c.

Your theory, as I understand it, is, that with each physical segment of the *nais* there remains a perfect worm-form of the incorporeal and invisible *nais*, and that this incorporeal organism is the substantial pattern or guide in and along which the physical bioplasts of the animal

work in order not to make a mistake and thereby produce, in the salamander for instance, a *tail* instead of a leg. This reasoning seems to be very conclusive, but there is one serious objection to your position which I find myself unable to answer, to my own satisfaction, or that of others. It is this: A segment of the *nais* cut out from its middle must project an incorporeal *nais* in both directions which forms the invisible guide for developing by regrowth the two missing sections of the physical body of the worm. Then this being so, the leg of the salamander should retain the incorporeal form of the whole animal attached to it as well as the salamander retain the incorporeal form of the amputated leg. Is not this the case? My trouble then is, why does not the amputated leg develop into a complete salamander, as well as a complete leg develop from the physical stump which remains attached to the animal, and in this manner produce two complete salamanders, on the same principal that a *nais*, if severed, will develop two similar worms?

By answering this in *The Microcosm*, you greatly oblige an earnest and interested reader of your paper. Yours, very truly,

C. A. BATTLE.

St. Louis, Mo., April 20, 1882.

ANSWER.

Dr. Battle's difficulty is quite a natural one, but it grows out of a misapprehension. The *nais*, for example, is composed of a number of vital centres distributed along the entire length of the body, from each of which a pair of legs project. If a section of this worm should be cut out containing one of these vital centres, which necessarily possesses the function of nutrition, the process of assimilation and growth will keep the bioplasts at work, and thus enable them to build out the physical structure along the invisible organism which attaches in complete form to every such vital segment. But if a section of the *nais* should be cut out from between two of the vital centres it would die and decay for want of the nutritional function and process. In the higher orders of organic life, as in the salamander, there is but one vital centre where processes of nutrition and food-assimilation are carried on. Hence, it is plain, that a leg, having no such vital centre, if amputated, will die and decay, since it does not carry with it the invisible form of the whole animal as it would if it possessed a vital centre of growth. The difference in the two cases may be illustrated by the common potato, having many "eyes" or vital centres distributed along its body. A piece of such tuber however small, so it only contains an "eye," will grow if planted, and reproduce pota-

toes; while a piece cut out of the same tuber, however large, if without an eye, will rot in the ground, because it does not possess the vital, incorporeal organism or form of the original potato. This idea of an incorporeal organism is thus seen to extend equally to animal and vegetable life as is definitely urged and corroborated by Rev. Dr. Hamblin, of Poughkeepsie, N. Y., in a learned article in last month's issue of *The Microcosm*. We trust the foregoing answer will be satisfactory to Dr. Battle, and to others who may have thought of the same objection.

SUN-SPOTS—AURORAS—CYCLONES.

For a generation or more scientific men have entertained an impression, not defined by any fixed boundaries, that there existed some sort of natural relation between spots on the sun, auroral lights, and tornadoes. These impressions have arisen more from the occasional coincidences of these natural phenomena than from any scientific theory that might reasonably lead one to suspect their simultaneous occurrence. For a few years, however, meteorologists have been casting about them for scientific facts, or at least rational hypothesis, upon which to base a probable theoretic connection between the three phenomena named. Let us see if any such relation can be shown reasonably to exist.

That they occur together, or in rapid succession, we have had the most indubitable proofs in the quite recent unusual size and number of sun-spots, in the almost unprecedented display of northern lights, and in some of the most violent tornadoes ever witnessed, in which even stone buildings, as in Fayette County, Pennsylvania, were blown down. These cyclones occurred from about the fifteenth to the twenty-fifth of April last, and are no doubt fresh in the reader's mind. The spots on the Sun at that time were so large as to be visible to the naked eye through smoked glass, while the electric disturbances during and for days following the great auroral display were such as to be sensibly felt by the writer, and which were known to prostrate many persons of peculiarly nervous temperaments, even causing them to faint.

It is well known that rain storms and clouds collect electricity as proved by the lightning flashes and thunder peals which accompany them. It would not, therefore, be an unreasonable scientific supposition that an unusual addition to the air of the electric fluid which causes a brilliant auroral display, would also tend to throw the upper strata of our atmosphere into commotion, thereby generating the displacements near the earth needed to fill up

the vacuums in the higher regions caused by the eddying whirls and convolutions that probably keep pace with the billowing streamers and waving, surging folds of such auroral display. That these lights are but the movements of electric torrents through the regions of our air, is clear from the magnetic action exerted upon our telegraph wires and instruments.

But what have these electric storms to do with the sun-spots, or vice versa? Is there any probable connection? It is evident that the light-centre and heat-centre of the solar system, includes also the life-centre or the animal and vegetable kingdoms of all the planetary worlds where organic forms exist; and by all analogy which we are enabled to draw from our observations of the effects of electricity upon living forms here, we may infer that the sun is the central fountain of that fluid, so much allied to life and so much like vitality itself, which we recognize under the general name of electricity. It is even held by many as a rational supposition that the soul and spirit are but different forms of organized electricity. That certain concurrent junctures of the different members of the solar system may tend to draw off varying quantities of this fluid from the sun is not improbable. We have then only to suppose that the chromosphere of the sun owes its reddish hue, and the photosphere its intense brilliancy to the ocean of electricity surrounding that mighty orb as its luminous atmosphere (since we know that electricity does produce luminosity in our auroral displays, and since an electric light is of very much the same nature as sunlight), and we will readily perceive that any unusual draft upon the central fountain might leave open or partly vacant spaces in the Sun's envelop, making them of sufficiently less brilliancy to appear like dark patches upon the solar disc. These spots then may be regarded as due to the unusual drain upon that vitalizing fountain made by the various planets, and by which their own atmospheres are occasionally surcharged with the same electric fluid that constitutes these auroral storms. Hence the concurrence of such storms and the sun-spots which would be but the temporary absence of large quantities of this substantial fluid drawn away from the sun's electric disc. To aid in support of this hypothesis, let astronomers direct their powerful telescopes to the dark body of Venus when in crescent, or to the unlighted portion of the gibbous Mars, at some time when sun-spots are seen at their maximum, and we may safely predict that auroral displays will eventually be witnessed upon those planets caused by the same electric flows which light up our own atmosphere, and

whose absence from the sun leaves these vacant spaces in its luminous envelop. At all events it will cost nothing for astronomers occasionally to vary their monotonous search for comets, with even the forlorn hope of catching a glimpse of an auroral display on one or the other of our two nearest neighboring planets.

That we do not always experience these auroral storms when sun-spots are visible, is no proof that they are not caused by absence of electricity, or that other planets are not at these times encountering more than their usual supply of that fluid. There may in fact be constant streams of the sun's electricity circling out like mighty rivers in ellipses between that central orb and the various planets of the system, each river having its greater and lesser flows, produced by unknown causes, similar to rises in our streams of water at different seasons of the year. This being assumed, may not the concurrence of these electrical *freshets*, so to speak, rushing away from the sun, draw occasionally upon that central supply to such extent as to produce these dark open spaces, even when these freshets are wasting their energies in inter-planetary space and thus not producing auroral lights upon any of the planets? This hypothesis would thus account for sun-spots without simultaneous auroras, leaving it true, as we believe, that great auroral displays are always accompanied by sun spots, thus proving that the electric supply for a great display of northern lights is always drawn away from the sun's disc. At all events, whether our solution of the problem meets the case satisfactory or not, here is an hypothesis and the semblance of a theory by which to explain the cause of this remarkable coincidence, which, so far as we know, has not before been ventured. Better, by far, an imperfect, and even wrong, hypothesis, than none at all, in grappling with Nature's mysterious phenomena, for thereby thought is evoked and discussion instigated which may result in a real solution of the most profound mysteries.

AUTOMATISM OF ANIMALS.

WE have received a very interesting communication on the above subject from the pen of Dr. W. F. Humphreys, of Concord, Mo., too long for publication, in which this very original and thoughtful writer takes the ground that *intelligent consciousness* belongs alone to the human species, while the apparent manifestations of consciousness in lower animals are but automatic, or reflex actions under the direction of an unconscious instinct. He even denies that the most intelligent of the lower species, such as the horse and the dog, possess

an intelligent consciousness of *pain*, and that what appears to be pain in an animal is but the automatic muscular effects of this unconscious instinct. Even the animal *cries* of pain he explains in the same way, and shows from numerous illustrations, that animals, after life is extinct, are known to utter cries and make all the physical manifestations of conscious suffering through the application of electricity and other means. He shows that a drop of acid placed on one thigh of a decapitated frog will cause this dead animal to raise its other foot in order to scratch the irritated part. He proves the absence of a conscious suffering in such automatic actions by the case of a man who had lost all feeling in the lower portions of his body by spinal paralysis. On tickling his feet his legs would jerk and twitch. When asked if he felt it, he answered no, *but my legs did!* In this way alone the Doctor urges that animals owing to the want of reason and the absence of a conscious spiritual entity or ego, do not suffer pain in the conscious or intelligent sense that man does, and that herein lies the true distinction between the immortal soul of man and the instinct of the brute that perishes. He urges that the muscular contractions, automatic cries, and other expressions of apparent suffering, are no more proof of conscious pain than is the recoiling shudder of the mimosa, or sensitive plant, evidence of intelligent suffering on receiving a blow from the hand.

The moral lesson drawn from this reasoning is that it harmonizes God's attribute of goodness with the economy of Nature, in allowing animals to feed upon each other, and in providing that man should also feed upon animal food as well as vegetation. How, asks the Doctor, could God be supremely good and create the tiger with an appetite that can only be satisfied by tearing to pieces and devouring the roe or the antelope, if such innocent quadrupeds really suffer the conscious pain that their muscular automatism would indicate? And how could God be supremely good to provide that man should eat and sacrifice the innocent lamb if this creature truly experiences the same intelligent consciousness of pain that a child would feel by the aid of the ego of its immortal spirit? Hence the heinousness of the crime of taking the life of a human being, and the substantial harmlessness of vivisection.

We present this synopsis of what may prove the nucleus of a new philosophy of physiological and psychological science, and we hope that readers of *The Microcosm* will study the questions involved, with a view to reaching correct conclusions upon so important a subject. If it be as Dr. Humphreys here insists, it will mollify

to some degree the sensitive repugnance felt by some people in killing even a chicken when necessary for food. A friend of ours, a very intelligent lawyer, is so keenly impressed with sympathy for the supposed sufferings of animals thus slain for food, that he can never be induced to kill a chicken for his table, and so strongly is this impression riveted upon his mind that he willingly goes hungry before he will eat, when killed by others, of an animal's flesh, especially one that he has himself raised. If this synopsis of the Doctor's argument does no good it may tend to tone down this somewhat amiable sensitiveness of our friend and others like him.

◆◆◆◆◆ "WATER-WITCHING."

MR. O. M. PATE, of Sulphur Springs, Texas, wishes our opinion of the mysterious performance believed in by so many called, vulgarly, "Water-Witching," that is, the tracing of underground veins of water, especially mineral water, by the supposed bending downward of a forked peach limb when held over the proper location. Our decided opinion is that it is all a silly delusion on a par with witchcraft generally. We do not doubt but that many persons imagine honestly that the twig bends downward at certain spots of ground without their involuntary assistance, alone by the attraction of the underground current or mineral deposit, as the case may be. But to prove that it is all the result of their own involuntary muscular assistance, helped by pure imagination, let them secure the peach branch in artificial clamps like the human hands, and then pass under it any quantity of mineral or water, and if it responds in any degree let them report it to *The Microcosm* and we will be only too glad to confess our mistake. A delicate magnet might so respond to certain minerals, but we have yet to learn that there is any magnetic attraction in a peach limb or any other kind of wood. We regret to learn from Mr. Pate that there is a minister in his neighborhood who follows the occupation of tracing underground currents by this peach-limb process of "Water-Witching." We think he could be in better business,—possibly not better business for making money, but that which would be of much more credit to his intellect and benefit to the community.

◆◆◆◆◆ RUDIMENTARY ORGANS.

ELD. U. WRIGHT, of Dry Fork, Ky., writes us that our theory of the cause of rudimentary teeth found in the upper front jaw of the embryonic calf, which disappear at birth, as

argued in the ninth chapter of the *Problem of Human Life*, is not entirely satisfactory to his mind. We have only to reply that we are in the same fix. We do not propose the hypothesis (that the desire of the cow for upper front teeth through many generations has influenced these teeth in the embryo) as absolutely correct. We only gave it as more reasonable and probable than that of Mr. Darwin, which made his theory of evolution *progress backward*, so to speak! We proved only instructive but highly interesting, especially to clergymen. We therefore admit his contributions to the columns of *The Microcosm* and spots on her call. We demonstrated from the same authorities that a mare's imagination and memory had produced the courage, as a class, to wish to deny a hear- ing to every phase of religious belief.

REVIEWS OF BOOKS, PAMPHLETS, &c.

We are receiving large numbers of books and pamphlets for review in *The Microcosm*. We are forced to make an honest confession—a clean breast of it, so to speak—and declare thus publicly that we (the editor, individually, in the singular and plural number,) have not time at present to read a book or pamphlet, however much we desire to do so. We, alone, write all the editorials for this paper, select all the other materials from vast numbers of communications, answer hundreds of urgent letters, and do all and singular the work generally done by a corps of three to half a dozen editors and managers of such a wide-circulated paper. We are waiting for some enterprising business man to turn up; one who likes journalism, wants business that will ultimately be a "big thing," and who has money enough to buy a half-interest in *The Microcosm*, and who will thus become a working-partner in this grand cause by which to take a load off the present editor and proprietor, and in this way make him manifold more efficient in his editorial work. This "good time coming" is, we think, not far off, when we hope to dip into the piles of literature now on our table and say what we think of them. Till then we beg of our friends, whose name is legion, to be patient with us.

MICROCOSM—SECOND VOLUME.

The time is now near when the second volume of *The Microcosm*, in magazine form will make its appearance, and, as already announced, in accordance with a widely-expressed desire, the editor's engraved likeness will appear as a

Emanuel Swedenborg who, whatever may be thought of his claim to special communications from heaven, was a man of profound thought and a writer of the most wonderful breadth and range. We issued the present volume at too low a price (though it has served its purpose in creating a lively and wide-spread interest in its contents) in the first number.

REV. STEPHEN WOOD'S ARTICLES.

WE call attention to Mr. Wood's articles on account of their peculiarity. They evidently

Emmanuel Swedenborg who, whatever may be thought of his claim to special communications from heaven, was a man of profound thought and a writer of the most wonderful breadth and

any or all in animals.

If the mental action of an animal can do these, could a thorough-bred Arabian horse, coltsired by a thoroughbred Arabian horse, generations in the cow for upper front teeth might impress these organs upon the embryo, though not yet with sufficient force to cause them to remain or to develop into premature incisors? Bro. Wright's objection, that these teeth ought not to stop in this embryonic condition, after so many generations, assumes for a fact that which he knows nothing about. It has only been recently discovered that embryonic calves have these incipient upper front teeth. They may have only just arrived at this condition, by the long action of the desire of the cow. How does brother Wright know but that future generations may yet give upper teeth permanently to the bovine genus, as an improvement wrought by the force of the mental over the physical organism of this tribe of animals? We must admit facts as we find them, and if *horns* can be impressed on a calf alone by the mental action of the mother, may not upper front teeth also be finally so impressed, and still not involve the extreme view of the possible evolution of a cow from a cat-fish? We threw out these provisional hypotheses in reply to those of Mr. Darwin, and as reasonable stand-offs. We did this to elicit discussion in hopes that real light may yet shine upon this difficult question of rudiment.

discussions) and all the moneys received in subscriptions, as well as the proceeds of more than 13,000 copies of the *Problem of Human Life* have gone into the expenses of supplying our subscribers including the specimen copies of *The Microcosm* which we have sent far and wide to aid the cause of its general circulation. We believe, from the evidences we have received in almost numberless letters, that no reader grudges the money he has paid for the present volume, and we feel equally sure that very few will object to the \$1 we are obliged to charge for the enlarged and improved volume soon to commence, as per prospectus on eighth page. Friends of our paper, who believe it has a mission of good to carry forward, in meeting the materialistic tendencies of the times, and who can spare the subscription price one time as well as another, can, if disposed, send at once, and their letters will cheer us by the assurance that our labors are appreciated. We trust that every present subscriber will not only see it to be his interest to read the new volume, but that each one on sending in his renewal will, if possible, for the good of the cause, send one or more new names for the second year.

Agents who were so kind as to send us the lists of names for the present volume, with the money, will do us and the cause unspeakable good if they will take it upon them to aid such subscribers in sending their remittances for the new volume, though each subscriber can, if he prefers, remit the dollar for himself, and thus help us to make the second year a still grander success than the first.

We thank God day and night for the blessings that have been so copiously showered upon our efforts thus far through the present volume, and we feel certain that the same Providence will guide our little bark through the storms we are sure to encounter in the next. We already see in the distance the shimmering of the war-banners of modern science marshaling the hosts of materialism for the final conflict. In the strength of Israel's God we hope to have *The Microcosm* ready for this battle. Its tilts with the enemy thus far we believe to have been only the skirmishing of the outposts which have tended to bring on the general engagement. Modern science is already drunken on the drugged wine of self-sufficiency and implicit faith in authority. Already it staggers as it strikes, while its moth-eaten spear-shafts shiver at the touch of truth. Readers of *The Microcosm* listen! and before the coming volume is ended, unless we prophesy falsely, you will hear the triumphant shout of the returning crusaders keeping time to the grand march of victory that shall an-

nounce the unconditional surrender of at least two of the chief fortifications of modern materialism, namely, Darwinian evolution, and the undulatory theory of sound, light, and heat. Let "natural selection" and "survival of the fittest" break down, as break they must, and no power of man will be able to hold the Darwinian fort. Let the wave-theory of sound, as the representative mode of motion in natural philosophy fall to pieces, as it has already fallen, and the main pillar upon which the temple of materialism rests will be shattered, involving the entire superstructure in ruin. *The Microcosm*, during the year about closing, has not been idle in its efforts at preparing the country for the approaching and final conflict between science and religion. Through its warning notes tens of thousands of thoughtful minds are already on the alert, and are looking anxiously for the beginning of the end. We do not boast nor exaggerate when we assert that atheistic science stands less strong upon its feet than it did a year ago; and we but echo the verdict of thousands of our more intelligent readers, when we claim modestly, that this little journal has done its full share in aid of so grand and glorious a consummation. With the reader's aid we propose that the revolutionary work shall not flag.

"THE TRIAL."

WE expect next month, in the last issue of the present volume of *The Microcosm*, to make an extract from a very remarkable book which we have received from the author at Birmingham, England, published under the above title. The author's name does not appear in the work and we are not at liberty at present to give it, though we know him well by correspondence. "The Trial" is in the form of a lawsuit conducted in a regular court of law, and the parties to the litigation, as well as judges, jury, attorneys, witnesses, officers of the court, etc., are represented by fictitious characters, such as Lord *Penetrating Impartiality*, Mr. *British Protoplasm*, Mr. *German Mysticism*, Mr. *Honest Doubter*, Mr. *Candor*, Mr. *Total Indifference*, Prof. *Bioplasm*, Mr. *Hopeful*, Mr. *Observer of Facts*, Mr. *Lover of Truth*, etc., etc. The action is brought by the *Era Protection Society* against *Paul Christian*, and others, for propagating the doctrine of the Resurrection of Christ. During this formal lawsuit the evidences of Christianity were presented in a most formidable and convincing light. At a certain stage at the trial Prof. *Bioplasm* is introduced as a witness for the prosecution in favor of modern evolution, and the theory of

spontaneous generation as taught by the great scientific authorities, Mr. *Leschar Wind* (Darwin), and Prof. *Hawk Ill*, (Haeckel). The cross-examination of this witness is conducted by Mr. *Discerner-of-Facts*, and becomes intensely exciting as Prof. *Bioplasm* is forced step by step to stultify both *Leschar Wind* and *Hawk Ill*, and finally to give up the whole theory of development as impracticable and self-contradictory. We will only add that this entire cross-examination is taken from the *Problem of Human Life*, and is but a verbatim condensation of its arguments, the author of "The Trial" at the same time giving full credit in open court to the book from which his points are taken.

THE VELOCITY OF LIGHT.

THE *Christian Standard* prints a lengthy and generally interesting paper from Dr. J. C. Lord on a *fixed star*, in which he speaks of the velocity of light as "one hundred and ten miles a second;" and as this statement is not in figures but spelled out as quoted, it becomes a serious misleading mistake since it is universally agreed that instead of "one hundred and ten miles a second," it is about 190,000 miles a second! Dr. Lord would do well to commit some elementary work on natural philosophy or astronomy before discussing the distance of the fixed stars as judged by the velocity of their light or by their inappreciable parallax.

THE TOP-PROBLEM.

THE highly respectable *Methodist Protestant* of Baltimore, Md., has been induced by some unaccountable oversight on the part of Dr. Drinkhouse, to publish a letter from the pen of one D. B. Turney on the above subject, in which he charges the editor of this paper with the most stupid ignorance as shown in his solution of the above named problem as published in the January *Microcosm*. Of course we understand the source or inspiration of this article in the *Methodist Protestant*. Turney is not capable of writing it. We see the unmistakable ear-marks of a sorehead who threatened us with all sorts of dire things because we did not award him the prize for one of the most laughably absurd and silly solutions in the entire hundred and fifty received. But Turney seems willing to be used as a cat's-paw, to convey the vulgar spleen of his principal to the public, so we ought not to object if the Editor of the *Protestant* is satisfied with such unsavory stuff for his paper.

THE HEAT GENERATED BY SOUND.

PROF. A. GREGG, of Newman, Ill., thinks that the *Problem of Human Life*, instead of exaggerating the difficulty of the heat question in the way of the wave-theory of sound, rather underestimates it. He contends that if the sound of the steam siren ten miles from the instrument still generates heat sufficient by compressing the air to add 174 feet a second to its velocity, if traced back to the siren the heat ought to be sufficient to melt granite, should it increase in proportion to the intensity of the sound. But Prof. Gregg being only a country teacher is not supposed to be yet fully initiated into the beauties of these mathematically formulated "modes of motion." When he comes to learn the relation of the superposition of complex systems of air-waves acting together according to the law of the parallelogram of forces it will all be plain to him.

SOUND ONLY IN SENSATION.

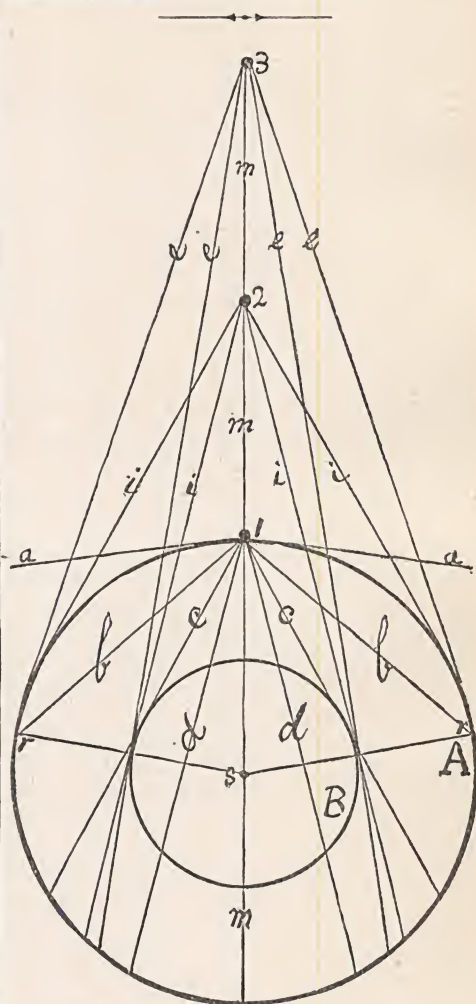
WE recently listened to a lecture from a scientific man, who evidently thought he knew whereof he spoke, and who claimed there was no such thing as sound, save in the sensation of the one who heard it. In other words that sound has no existence external to our auditory nerve; and if everybody and every animal were deaf, all sound would necessarily cease to exist, &c. Now this view, though entertained by some learned physicists, is manifestly absurd. As proof that sound really exists outside of our senses, we have the physical demonstration of one string vibrating by sympathy from the sounding of another unison string at a distance. If there were no such thing in existence as the sense of hearing this phenomenon of sympathetic vibration in a distant string would be manifest to the sense of touch, as it now is to touch, sight, and hearing. A man is a very superficial reasoner who cannot distinguish between our sensations and the external causes which produce them. Surely *light* is not the sensation of seeing which it produces, any more than *odor* is identical with the sensation of smell, or than *sugar* or *vinegar* is identical with the sensation of taste. If all men were without the sense of taste or smell it would not banish these external causes of taste and smell from existence. The light of the sun and the roar of the ocean would exist all the same whether or not any living thing in the universe were present to experience the sensations which they naturally produce. Hence all these external causes of sensation in the vital and physical economy of man, must have

a real, entitative existence outside of us, without reference to whether we exist or not. The man who can argue that sound only exists in our sensation, would also insist with the same reason that the *table* or *chair* which he feels by touch only exists in his tactile sensation! Yet if he were struck with total paralysis, so he could feel nothing, it would in no wise affect the substantial existence of the table or chair! The erroneous view, to which we have here referred, is but a modification of the views of Comte and Hume to which we reply at page 31 of the *Problem of Human Life*, namely, that there is nothing *real* in Nature except the *impression* which natural objects make upon the mind.

STRANGE ELECTRICAL PHENOMENON.

WE witnessed in our office recently, in handling printed copies of *The Microcosm*, one of the most unaccountable freaks of magnetism we ever encountered, and one by all odds the most difficult of explanation. A number of sheets of the paper were spread out in a pile upon a table, just as they had come from the press. We took the topmost sheet by its two ends and lifted it from the table in order to examine the impression, and suddenly, while holding it a few inches above the pile we felt a strange pulling down upon the sheet we were holding as if it had been weighted to fifteen or twenty times its normal gravity by pouring water upon it. We were surprised and called the attention of several persons present, who made the same experiment of lifting the top sheet and observing the unaccountable downward pull—almost enough to tear the sheet from their hands. There was evidently some sort of magnetic attraction exerted by the pile of sheets on the table upon the single sheet held above it. The most singular part of this phenomenon was the distance at which the downward pull seemed at its maximum. Unlike the attraction of a magnet, the force drawing the sheet did not seem to increase rapidly as it neared the pile, but seemed strongest when the upper sheet had been raised several inches above the pile. After many careful observations we have no hesitation in asserting that at such a distance the uppermost sheet was fully fifteen to twenty times heavier than when removed entirely from the table. Now who can solve this problem? We confess it baffles our ingenuity, though we hope to be successful by still further observation and experiment. Our book-keeper then placed his hand above the pile and the top sheet at once lost its gravity, and leaped upward from the pile against his hand! He then held his hand some inches above a pile of newspaper wrappers

lying on an adjoining table and the topmost wrapper sprang upward and clung to his hand so that it was carried in this position about the room. What does all this mean, and what does it teach as a lesson of science? We do not believe it has anything to do with modern spiritualism nor does it embody anything supernatural; though nervous believers in mediumistic phenomena might jump to the conclusion that here was palpable evidence of the presence of departed spirits. We believe that these strange occurrences will yet be fully explained by natural laws though how, is at present a puzzling mystery which has left the editor in a state of perturbation. If we make any discovery upon the subject our readers will of course find it out.



PROF. GOODENOW ON GRAVITATION.

LAST month we made a partial reply to Prof. Goodenow's criticisms of our March article on Newton and Gravitation. In that reply we

paid particular attention to Newton's so-called "demonstration" of the moon's fall from its tangent and the force of gravity exerted upon it measured by the "real true yard-stick," as Prof. Goodenow called it, of a stone's fall 16 1-12 feet in a second on the earth's surface.

We come now to consider the other branch of the Professor's criticisms of our March article against Newton's law. We place at the head of this paper the same diagram we then used, in order to aid the reader who may not have the March *Microcosm* at hand. And here we state as we did last month that Prof. Goodenow has misapprehended our real position and argument. More than one-half of his paper, as published last month, was aimed to demonstrate something we never doubted and something we believe as firmly as he does, namely, that the body at 1 *weighs* the same, very nearly, that it would weigh if it remained stationery in space with the whole earth condensed to a single corpuscle at the center *S*. We have never doubted but that the change in distance of that portion of the earth near the body at 1, and which produces the more powerful part of the earth's attraction in consequence of such nearness, would fully counteract the various side-pulls now exerted upon the body at 1, but which are not converted into weight in consequence of their partly contrary attractions. Prof. Goodenow argues this point just as if it were the main position of our attack upon Newton's law. The *Christian Standard* and the learned (!) Prof. Hornung both make the same mistake in elaborate articles, supposing that to be our main ground.

But the reader may ask, if Prof. Goodenow is thus mistaken what is your real position against Newton's law? We will try to make the matter understood. We denied the correctness of his 75th Proposition, namely, that the body at 1 is now *attracted* by the earth "the same as if that whole *attracting force* issued from one single corpuscle placed in the centre of this sphere." These are Newton's words, correctly applied as Prof. Goodenow admits, and are self-evidently false, as we think, on their face. He does not say that the body on the earth's surface, as at 1, *weighs* the same as it would if the whole earth were reduced to a central corpuscle. Had this been the matter involved there would have been no dispute about it. But the whole drift of the Propositions of Newton is that the *attraction* of the earth is the same upon the body at 1 as if the earth were all concentrated "at the centre of this sphere;" whereas we know that there are vast quantities of *side attraction* exerted upon the body at 1 not now converted into weight, but which would be thus converted were all

these attracting portions of the earth brought to the central line, *m s*, with each particle kept at its present distance from the body at 1. These lateral portions of the earth, near the lines *a a*, *b b*, and *c c*, now *attract* the body at 1 with the same force precisely that they would if condensed to the central line, *m s*, with distance preserved, but the various attractions being now partly opposite to each other, they do not produce full effect in weight, though the real attraction is none the less exerted upon the body at one on that account. How, then, can Newton truthfully teach that the *attraction* of the earth is "the same" on the body at 1 now as it would be if all this vast portion of the earth were condensed to the center? Plainly there are now side attractions lost and wasted on the body at 1, by contrary pulls. If the earth were condensed to the centre, there would be no waste attractions exerted sideways, but they would all be converted into *weight* on the line *m s*, weakened, of course, by increased distance. How then can the earth's *attraction* be "the same" upon the body at 1 in both cases, as Newton's 75th Proposition teaches? If the earth as a mass attract bodies outside of it "the same" as if it were all condensed to a central corpuscle, then each individual corpuscle must now attract the body at 1 as if said corpuscle were removed to the centre *s*. Hence we were correct in our March article in charging that the corpuscles at *r r*, according to Newton's law, attract the body at 1 with the same force as they would if removed to the centre.

Now what we have aimed to show in opposition to Newton, is, that this side attraction, not now converted into weight, is not lost or dissipated when the body at 1 is removed to 2, or 3, but is partly converted into additional or proportional weight by the lines of the attraction becoming less lateral, or by their approaching more nearly to the central line *m s*. At each removal of the body above 1, these side attractions change more and more into weight above the proportion of squared-distance-inverse by approaching more and more nearly to the central line. Hence, that the body while rising from the earth's surface does not decrease in weight according to the inverse square of the earth's radius, because these side-pulls are all the time being converted more and more into weight by change of angle toward the centre; whereas before removal of the body from 1 to 2 the neutralized side-pulls cannot be thus converted. Is not this plain? As proof positive that this view fairly upsets Newton's "pure mathematics" of the earth's radius as the true unit of decrease, we will take his own supposition that the earth is now con-

densed to a single corpuscle at the centre, s , and that the body at 1 remains at the present distance (4,000 miles) from this centre, and of course that it is of the same weight as at present. It is perfectly plain that the removal of the body from 1 to 2 (4,000 miles farther) would reduce it to precisely one-fourth of its weight because there would be a clear first unit of 4,000 miles between the source of attraction, s , and the body at one to begin with, *and without any attracting substance whatever intervening* to mar this ratio. Hence the law of inverse squares would come into full and legitimate play. But with the earth, as now situated, coming clear up to the body at 1, and filling the entire space from there to the centre, *there is no first unit of free space and consequently no true principle of squared-distance-inverse can come into play in the removal of the body from 1 to 2!* The very nature and the very idea of diminishing according to the law of inverse squares presupposes a first unit of vacant space before the body to be estimated is removed a second unit of distance! But here come Newton and his follower Prof. Goodenow, and take the body at 1, resting solid against the attracting mass, and by removal of it *one unit* declare a decrease of weight equal to a second unit of distance! Look again at the idea of the earth condensed to a central corpuscle, as supposed by Newton, with the body still remaining at 1. Prof. Goodenow will not dispute but that the removal of such body to 2 will act precisely in accordance with the law of squared-distance-inverse, thereby reducing the weight of the body to *one-fourth!* This being so, it is self-evidently manifest that the same decrease of weight cannot take place by removing the same body from 1 to 2, *with the most attractive portion of the earth still remaining snug up at 1.* The difference in the two cases will simply be the amount of proportionate weight gained by the body in removing from 1 to 2 over the law of squared-distance-inverse in consequence of the change of the angles of the earth's attraction more nearly to the central line than they are now while the body remains at 1.

But we now come to the most important inquiry of this discussion, namely: What is the actual amount of this side-pull of the various parts of the earth's mass as exerted upon the body at 1, which is not now converted into weight, but would be thus converted, as we have assumed, if the whole earth were condensed to the central line, $m s$, the present distance of all the particles being preserved?

In writing our reply in last month's *Microcosm* we were under the impression, from reading his letter, that Prof. Goodenow conceded a

loss of weight to the body at 1 of *one eighth* on account of these contrary side-pulls of gravity. But upon careful re-examination we discover our oversight, that this calculation of a loss of *one eighth* was made by him when he was "younger and greener" than he is now, as he told us, and that he had since figured himself out of such absurdity thus discovering his mistake. He therefore concludes, as we now see his letter, that Newton was right, and that his former calculation was wrong, leaving the body at 1 just as heavy as it would be with these side-pulls converted into weight, or, which seems to be the same thing, that they are already thus converted.

To make sure that we did not misrepresent the Professor's views upon this important matter of side-pulls, we wrote him some weeks ago, and requested him to state definitely and say in as few words as possible and in plain figures just how much more, if any, the body at 1 would weigh than it does now if the whole earth were thus condensed horizontally to the line $m s$, each particle of matter retaining its present distance from said body at 1. We expected, and had a right to expect, a frank and candid answer without the least evasion or prevarication, for we knew that so eminent a mathematician and astronomer was entirely capable of figuring out such a problem and we believed he was not afraid to do so. We had distinctly argued in the March *Microcosm* from a rough calculation of our own, that the body at 1 would weigh about double as much as at present, supposing the earth to be thus condensed. But we wanted "pure mathematics," and an absolutely correct statement on which to base our final argument. Hence our sincere request for information. What was Prof. Goodenow's answer? The reader will be astonished to see it. Here it is, verbatim, and we ask every one who reads this discussion to examine it carefully and then draw his own conclusion:

"ANSWER:—To condense "horizontally" and maintain the "present distance" of each molecule from the attracted body, that body must be at an infinite distance, where no side-pull is felt; and in that case the condensed substance would lie equally along each side of the centre. But with the attracted body at the surface, a condensing of all the molecules to unchanged distance on the central line cannot be done "horizontally," but will carry a much larger part of the substance beyond the centre than will remain on the near side of it. Each molecule will have the same attraction as before condensation, but no longer reduced (as before) by side-pull. So that, as before condensation the substance of the sphere had a centreward effect as if it were all at the centre. The centreward effect after condensation will be *more* than if the substance were all at the centre; and just as much more as the

actual attraction in all directions exceeds its reduced effect centreward. In other words, the total reduction of centreward effect by side-pull is restored by condensing the whole substance at unchanged distance along the central line; making the total force after condensation the same as before reduction for side-pull, namely, larger (by reduction value) than if all were at the centre. *This makes the weight of the body attracted greater by reduction value after the condensation [italics ours] its tendency being along the centre line toward a point nearer than the centre*; although so much greater part of the substance goes beyond the centre in the process of condensation, the several molecules need to be carried away in condensation still farther than unchanged distance, enough to overcome their previous deficiency of distance while under the reducing effect of side-pull. This will reduce the force (and the weight of the attracted body) just as much as it has been made excessive by the loss of the reduction for side-pull, and will leave it the same as if all the substance were condensed to the centre, that is, the same as the actual centreward effect (and weight) produced by the oblique attractions now before condensation."

Here reader, positively, is the answer, and every word of it! We will not characterize it as we now feel like doing. At first reading it struck us as if carefully framed to avoid answering at all lest the answer might give us another "yard-stick" to use against Newton's law. What was the use, for example, of his stopping to criticize the word "horizontally" and quote it twice, when he evidently knew we did not use it in the geometrical or mathematical sense, but only in the general sense of sidewise? He knew this by our specifying that each corpuscle of the earth should retain its present distance from the body at 1. Yet he wastes all these words in an inconsequential distinction, and still does not tell us what we asked and what could have been told in one brief sentence! Why, did he not for example, say frankly that the body at 1, after such condensation of the earth to the central line $m s$, would weigh double as much, or three times as much as it does now?—*one half more, one quarter more, one eighth more, or one seventh more than it does now?* Why did he not answer something in a frank and fearless manner, when it could have been done concisely in twelve words? Is there any explanation possible, of this manifest evasion, save the one we have given, and that he preferred to avoid the answer by saying in a round-about way as he did? *This will make the weight of the body just as much greater as will equal the effect of the side-pulls*; a thing we knew before? Is this a specimen of the "pure mathematics" by which the boasted "demonstrations" of Sir Isaac Newton are to be vindicated? Really, we would rather perpetrate a dozen square, out-and-out blunders, frankly ex-

pressed, and then take them back, than be guilty of one such timid and forced obscurity to avoid a frank answer. Prof. Goodenow, knew positively how much this additional weight would be and that whatever increase of weight he should specify for the body at 1, as the effect of the earth's concentration to the line $m s$, with distance preserved, would have to be included in the final proportionate weight of the body when removed to the moon's orbit where the lines of attraction are practically brought down to a centreward pull owing to the reduced apparent diameter of the earth at that distance. He must have known that the entire attraction brought to bear upon the body at 1, including all side-pulls, would make it weigh largely more than it does now, that is, if the whole attraction of the earth were thus changed to a centreward pull, and that such additional weight must be taken into account in estimating the proportionate decrease of weight at 2, at 3, and finally at the moon's distance! And is it not manifest that such additional weight would totally break down Newton's ratio of the inverse square of the earth's radius, as the proper unit of gravity decrease?

We regret exceedingly that the professor should have felt unwilling to give us a frank answer, now that he is not so "green" as he once was, for then we could have shown exactly how much Newton's formula of the earth's radius as the true unit of distance falls short of mathematical accuracy, and of giving the true force of gravity at the moon. In the next number of *The Microcosm* we will consider, briefly, two other questions which we asked the professor and to which, fortunately, he gave distinct answers, and which we trust will settle this "guesswork" formula of the earth's radius as the unit of measure.

MAGNETISM AGAINST MATERIALISM.

MR. F. G. TASSEL, of Farrington, Minn., objects to our demonstration showing that magnetic substance will pass unimpeded through a glass plate, and move iron or steel, as if nothing intervened; and suggests the possibility of a mistake about the matter, and that the magnetic rays pass from the poles of the magnet around the edges of the glass plate, without passing through it, &c. This is a clear misapprehension on the part of Mr. Tassel, since needles sealed up in a bottle with glass stopper will be acted upon by this magnetic substance the same precisely as if no glass surrounded them. This we have demonstrated time and again, and any one, having a steel magnet, can do the same. No, my dear Mr. Tassel, this magnetic argument utterly annihilates the very

foundation upon which materialism and atheism are based, and their advocates sooner or later will be forced to surrender. It is only a question of time.

THE CHRISTIAN STANDARD AGAIN.

LAST month we held out the olive branch to the scientific editor of the *Standard* and proposed to shake hands across the "bloody chasm," so to speak, but he seems to be too much excited about something to "make up." We are sorry for this, as we really hoped for a genuine reconciliation. He now comes to the "scratch," as it were, in anything but an amiable mood, and with menacing flash in his eye, and with the war-cry of "More Bait," greets us with the dubious epithets of "consummate charlatan," "would-be iconoclast," &c., &c. These unfraternal thrusts, however, no more ripple our equanimity than if we had been kicked at by a government mule, so long as neither of them hit us. But what is really the matter with this scientist? The whole trouble seems to be that we do not believe with Sir Isaac Newton that the moon falls from its tangent, in traveling along its orbital path, with an "accelerated velocity" the same as a stone falls at the earth's surface; but on the contrary, that it falls toward the earth with a perfectly uniform motion, as much exactly in one second as in any other second, half as much in a half-second as in a whole second, and twice as much in two seconds as in one second. Strange as it may seem, the *Standard* critic has become irreconcilably indignant, because of the audacity of the editor of *The Microcosm* in thus taking ground against the received views of scientists upon this question of the moon's fall from its tangent, and accordingly proceeds to crush him summarily by quoting against him one of the very authorities which he disputes!

Now we propose to make short work with our critic, but we will not do it by bandying epithets with the *Christian (?) Standard*. We prefer to leave the congenial employment of calling ugly names to one so much better qualified for that kind of argument than for the more difficult labor of presenting scientific reasons. Let us now proceed to show by incontrovertible proofs that there is not one particle of reason or science in the received view of the accelerated fall of the moon from its tangent, or the slightest natural or geometrical relation existing between this assumed fall of the moon and the fall of a body on the earth's surface, and thus show that science is totally at sea upon this subject.

When we made our "yard-stick" argument

last month against Newton's law, as based on the moon's fall we were well aware of the geometrical formula by which this so-called fall of the moon from its tangent was made to appear *accelerated*—corresponding to the increasing velocity of the fall of a stone at the earth's surface,—and we now assert that the very principle of geometry involved as stated by Newton and reiterated by all authorities since, will be seen to be false and self-contradictory.

The reader need not take our word for this. Let him draw a circle, say six inches in diameter, representing the moon's orbit, strike a tangent from its upper side horizontally to the left, and step around this circle with a pair of dividers, marking half-inch steps or periods of the moon's travel from the point where the tangential line leaves the orbit, which periods of the moon's progress of course occur in equal times, and as certain as we are writing, it will be found by an accurate measurement from the tangent vertically to the different steps thus taken that there is maintained *no regular acceleration of velocity or departure from said tangent corresponding to that of a stone's fall on the earth's surface!* If there were any such necessary or natural acceleration, it is perfectly manifest that each step thus taken after the first, would measure from the tangent vertically *exactly as much as the preceding step with twice the fall to the first step added!* There is no variation from this rule in the acceleration of a stone's fall on the earth, as all experiments show. But what are the geometrical facts as regards the moon's acceleration in thus falling from Newton's tangent? Why, this ratio happens by coincidence to hold very nearly good for a short distance after the start along the circle, and then departs widely from it, and gets farther and farther away, overlapping more and more the true ratio as the moon approaches the first quarter of its orbit, where these steps of fall from the tangent become almost precisely of equal distance from each other, having lost all of their irregular acceleration, and for the good reason that the moon is now falling *almost directly at right angles, or in a straight line away from the tangent!* How could there be acceleration in such fall here, unless the moon should start off at a swifter rate of travel? We do not expect the scientist of the *Standard* to appreciate this or even to comprehend it, but we believe the smallest boys that read *The Microcosm* will have no difficulty in grasping it. We are astonished, as we make these simple measurements with dividers, that mathematicians should have overlooked such a self-evident truth, and should have taken for granted first, the fallacy of any *fixed* tangent, and then the erroneous geometrical formula that any regular

acceleration can result by measuring the moon's fall from it. It is simply astounding that Newton should have conceived the idea that there exists any natural or necessary relation between the moon's departure from such arbitrary tangent and absolutely mathematical acceleration of a stone's fall here! Get your dividers if you doubt our word, and demonstrate by measurement that there is and can be no regular accelerated velocity in the moon's fall from a fixed tangent from the start down to the first quadrature.

But the worst of the absurdity, growing out of Newton's assumption of a fixed tangent has not yet been reached. As soon as the moon passes the quadrature the steps from the tangent instead of accelerating begin to become shorter and shorter, as the moon advances in its orbit, till it gets to the opposite point from where the tangent leaves the circle, when behold! the steps cease entirely to leave the tangent and begin to come back toward it! A beautiful geometrical acceleration this! About as if a stone's fall would get less and less accelerated for a short distance, then commence to retard in its velocity, and finally stop entirely and start backward toward the place whence it was dropped! Thus is Newton's famous law of acceleration, governing the moon's fall from a fixed tangent exploded by following it around the orbit with a pair of dividers, proving that any fixed tangent whatever, to begin with, is an arbitrary and even ridiculous piece of chance adaptation, having not one rational scientific reason in its support.

But since a *fixed tangent* for estimating the moon's fall is self-contradictory, as we see, how, the reader will ask, do you consistently talk about "*the fall of the moon from its tangent?*" The answer is plain enough. The "tangent" from which the moon is continuously falling, as it travels along its orbit, is a *continuously changing rectilinear course* which the moon is constantly tending to pursue, and which it would pursue at any instant should the earth's attraction be cut off. It surely could not pursue Newton's fixed tangent, *because it would have to go back to get to it!* Hence the moon's tangent cannot be *fixed* or *permanent* for even a quarter of a second, but must change every instant of time, keeping pace with the moon's progress in its orbit, thus causing it to fall uniformly from hour to hour, from minute to minute and from second to second just as we have maintained, without any acceleration whatever. If Newton had a right to strike a tangent and maintain it even for one second, and thus claim the fall of the moon from that line a distance corresponding to a stone's fall here, then we have the same right to step back just

half of that second, strike another tangent and thus demonstrate just half as much fall for half a second as he shows for a whole second, and vice versa! As the very idea of a fixed tangent renders it necessary to shift the tangent to a new part of the orbit very soon, in order to prevent acceleration from becoming retardation and finally retrogression, why not take the only philosophical course and shift the tangent every instant, and thus make the fall of the moon uniform from its real ever-varying tangent, and in this way harmonize its motion with the principles of science and common sense? We thus see that the very idea of a *permanent tangent*, from which to calculate the moon's fall, or the influence that the earth's gravity exerts upon it, is a puerile absurdity unworthy of such a mind as Newton's, and it is equally plain that any mathematician who is capable of blindly accepting such a trick of astronomical prestidigitation must lower himself intellectually as a scientific investigator. How a man of science could have conceived of the arbitrary idea of a fixed tangent, involving as it does, if kept up, such self-contradiction as first, *irregular acceleration*, then *uniform progress*, then *retardation*, then *retrogression*, is more than we can imagine! Newton must have known that it is *down* toward the earth from every part of the moon's orbit, and as much from one part as from another; and that if we estimate the moon as falling toward the earth from any tangent whatever, it must of necessity be from an ever-changing, ever-progressing rectilinear course which constantly keeps pace with the moon. By this new analysis of the moon's mode of travel through the heavens,—new to the science of astronomy,—the entire law of Sir Isaac Newton as relates to the force of the earth's gravity exerted upon the moon, falls to pieces, and upon its ruins is here erected the beautiful, legitimate, and harmonious explanation which addresses itself alike to the understanding of a child and a philosopher. By this new and grand conception of the moon's orbital course we can see its ever-changing tangent sweeping the heavens as the moon swings around the earth, somewhat as the tail of a comet brushes the stars while its head is making its perihelion.

In view of these overwhelming considerations against the very idea of "acceleration" in the moon's fall, how the point melts off the lead javelin of the *Standard* as it makes the following thrust:

"When the editor of *The Microcosm* comes to understand (if such a thing is possible) what he is writing about, he will discover that the fall of a revolving body from a tangent to its path is with *accelerated velocity!*"

Yes; and if the scientific (!) editor of the

Standard should ever, by a miracle, learn the A. B. C's of science, or become capable of exercising one independent thought in matters of philosophy, he will discover that any *permanent* tangent, by which alone acceleration of the moon's fall can be inferred, involves the very absurdities we have just been pointing out, and from which there is no escape to the advocates of Newton's "demonstrations." Verily, the heading of his article in the *Standard*—"More Bait"—was prophetic; for if ever a prodigious *sucker* was found dangling by the gills from a Microcosmic hook, he now furnishes such a spectacle.

So much for the argument. But the pitiful part of this *Standard* business is yet to come. That same writer has been in the habit for several months past of narrating to his readers, whenever he has had occasion to pay his respects to *The Microcosm*, all about his "original blunder" (when he made his first unfortunate attempt to explain the law of gravitation), and tells them over and over how like a little man he confessed his error and took it all back in the next number of his paper! In this last attack he returns by force of habit to his seven-times repeated confession as if finally to induce us to follow his example. He says:

"If he had followed the *Standard's* example and corrected his *original blunder* as soon as he discovered it, he would have been spared all the humiliations sure to follow."

No, you don't! We can't be cajoled into making a confession till we have something to "confess for!" The scientists of the *Standard* may count his beads, cross himself and put on sackcloth every week from now till next Lent, if his conscience so dictates, but he will excuse *The Microcosm*. This paper has no present need of the confessional, especially on the question of gravitation, though it will stand with head uncovered every month while the *Standard* repeats its *Ave Maria*. We give it due notice that it must not get down in the ashes and then think of coaxing us down with a stick of scientific taffy in the shape of a bogus tangent! And now, while this penitent blunderer has his hand in, we would suggest that he make another confession and honestly tell the readers of his paper that the most unmitigated "blunder" of his editorial career is this last one, about the moon's fall from its tangent with "accelerated velocity." If he will do this at once the subscribers to that paper may forgive him. If not he can rest assured that the *Standard* is a marked journal! In conclusion, to offset this and similar attacks, we copy the following letter just received from Prof. Carter, A.M., C.E., Professor of Higher Mathematics and Physics in the Pa.

Mil. Academy at Chester, Pa., which will speak for itself:

"Dear Mr. Hall:

"I have just read your dissection of Prof. Goodenow and Sir Isaac Newton in this month's *Microcosm*. That means that I laughed; that I laughed repeatedly: that I chuckled prodigiously at the amazing simplicity of the operation. I was also just a little chagrined at my own failure to see the weak point in the "falling moon" and the "one second" business, because I ought to have been prepared, after my study of the *Problem of Human Life*, to look for weak places in such units of measure. Hereafter I shall immediately overhaul every unit of measure introduced in science and see if it is rational or accidental. I would like, however, to put in a plea for Prof. Goodenow and Sir Isaac. They, in company with Tyndall, Helmholtz, Mayer, *et al* are distinguished examples of what I call the unconscious adaptation of the human mind to the requirements of the theory in hand. You have broken Newton's "yard-stick." Send us "more copy!"

Yours Ever,
R. KELSO CARTER."

THE GRAVITATION CONTROVERSY.

WE have received up to going to press about two dozen replies to our "yard-stick" argument last month, from Professors of Astronomy, including Prof. Goodenow, all identical with that in the *Christian Standard* (except in wording), to which we reply elsewhere. When we challenged Prof. Goodenow at the close of our article to undertake the forlorn hope of proving that the moon falls from its tangent with *accelerated velocity*, we purposely left the impression that we were totally unaware that any scientist, had seriously undertaken to defend such a proposition. We felt sure of a general rush to sustain Newton on this point, and hence were willing for scientists to involve themselves as deeply as possible before making the final answer. The editor of the *Standard* appropriately calls this "more bait," and yet, with his eyes open, deliberately swallows it hook and all! Now we have only to say, if any mathematician can mend Newton's broken "yard-stick" by showing either sense or science in a permanent tangent, let him send us "more copy."

MICROCOSMIC DEBRIS.

GIRARD COLLEGE is to have a complete machine shop with a workbench, forge, and gas engine for each of the ninety pupils in practical mechanics.

A Swiss experimenter is reported to have manufactured artificial mother of pearl which cannot be distinguished from the genuine.

Secretary for the Colonies Lord Kimberley thinks the Panama Canal will open a great future to the British West Indies by placing them on the highway of nations.

A goat disturbed worship in a St. Louis church by trotting up the main aisle, mounting the platform steps, and trying to eat the green fringe of the pulpit drapery.

Charles Ross, a son of the Mrs. Ross who made the first United States flag as adopted by the Committee of the Continental Congress, is an inmate of the San Francisco poorhouse.

There is every probability that the company running steamboats on the Rhine will shortly attempt to light both shores of the river ahead by means of the electric light for the benefit of sight seers traveling at night.

In the far north of Europe spring has been unusually early this year. Primulas and rose-buds were gathered in Danish gardens in January, and the starling, the first harbinger of spring, had arrived from the south in flocks.

Returns from India state that the number of persons killed there by wild beasts and snakes has increased from 19,273 in 1876 to 21,900 in 1880. In Bengal alone, during the latter year, 359 persons were killed by tigers.

Lord Derby has several step-children—the children of his wife by the father of Lord Salisbury—but none of his own. His brother and heir is a steady Tory. They have one sister, Lady Emma Talbot, wife of the Sergeant-at-Arms in the House of Lords.

A new amusement in India is egg jumping. The act of jumping causes the involuntary closing of the hands in a tight grip; and in the contest of egg-jumping, whoever jumps farthest without breaking the egg that he holds in either hand takes the prize.

The warden of the Illinois penitentiary says that James Burke died in that prison of grief and remorse. He slew his brother, and a court and jury viewed the crime so leniently that he was sentenced to only five years' imprisonment. But his own estimate of his guilt was much higher.

The London Times says "the mass of Londoners know but dimly, and care but little, how they are governed. They are familiar with the tax collector, and tolerate his demands;" all of which attests their family resemblance to their New York cousins.

The London *Daily News* says that the four Moorwood brothers, who nearly killed their eldest brother after dining with him are in this country. The death of Jessie James makes a vacancy in the ruffian business which seems opportune with their arrival.

The golden rose which the Pope blesses on the Fourth Sunday in Lent and sends as a special mark of favor to one of the Catholic Princesses is this year destined by Leo XIII, for the Princess Stephanie, wife of Rudolph, Prince Imperial of Austro-Hungary.

Canine madness is much on the increase in Paris. From a report just issued by the official veterinary surgeon, there were last year 615 cases; 153 persons were bitten, of whom 23 died. In 1881 there were but 297 cases, and only 5 fatal cases of hydrophobia.

Winnipeg, the city of the Canadian far west, is crowded with adventurers in a sad plight. Floods have prevented them from doing any thing in the way of work, the railroad has been submerged for a month, all business except that of the boarding houses is at a standstill and destitution is becoming common.

Remark by the Rev. Dr. Hartzell, who is on a Southern tour, on being told that the Methodist Church South was the original Methodist Episcopal Church: "I belong to the Methodist Episcopal Church of God, and if you want to call yours the Methodist Episcopal Church South of God, I have no objections."

While a man was sitting in the crotch of a tree to saw off a limb, at Saginaw, Mich., the crotch split as the limb fell, letting him down into the opening and then closing on him. It took an hour of chopping and prying to get him out of the trap, and several of his ribs were broken by the squeezing.

The young women of Nevada City, Cal., amuse the town while amusing themselves. Twenty-four of them formed a company, in mockery of the young men's military organizations, and paraded in a uniform of red calico, with brooms for guns. Their last parade was to escort a bride to the railroad station.

Thomas Harrison, the "boy preacher," has finished thirteen weeks of revival work in Cincinnati. Crowds have been turned away nearly every night from the Methodist church in which he held services, and the converts number 1,800, while extra meetings in other churches swelled the list to about 5,000.

Joseph Cook, after lecturing in Calcutta, went for a rest to Dharjeeling, which is a sanitary resort on the Himalaya Mountains. His plan is to lecture in southern India, then to visit Ceylon, Japan, and Australia. He expects to return to Boston in December and resume his Monday lectures in that city.

The purchaser of an old house at Edgar's Ferry, Ky., saw that the floor in one spot was nailed down far more securely than anywhere else. Curiosity led him to remove the boards.

Underneath was a small mound of earth, from which he dug out the bones of three human beings. It is believed that a dead-and-gone occupant of the house was a murderer of travellers.

A Paris milliner has just concluded a contract by which a dealer in game in Berlin undertakes to deliver the skins of 30,000 pigeons during the season for the adornment of hats and bonnets. The birds are to be caught in all parts of Germany and taken to the railway yard, and there killed and immediately skinned, the skins being forwarded to Paris and the carcasses retailed for a small sum each on the spot.

The fish breeding and rearing establishment of Sir James Gibson Maitland at Howletoun, near Stirling, in Scotland, is the largest of the kind in the world. In the hatching house are many millions of fry.

A telephone company met and conquered unforeseen difficulties in laying an underground cable on Sunday between Attleboro and Mansfield, Mass. The wires were to be buried along the line of a railroad; but the farmers of the region refused to loan their horses or oxen for Sunday toil, and the plough was accordingly attached by a beam to a locomotive, which did the work with a rush.

At an agricultural meeting last December an Essex County English gentleman said: "I know of three owners of land in this county who have now no less—I am speaking carefully—than 5,000 acres for which they can find no tenants." Common laborers are getting from \$2.75 to \$3.75 a week. Essex is one of the "home" counties, as counties round London are called.

A silver dollar with a bit of concave mirror set into one side is by gamblers called a shiner. By laying it among his pile of coin and dealing over it, the operator can know what every player holds for that deal, the cards being reflected in miniature. A member of the Mining Club of Leadville has been caught using a shiner. By means of it he won \$2,500 in a night at poker.

The question involved in a St. Louis lawsuit was whether a wink, said to have been made by the defendant, qualified the words which he uttered at the same time. He told the plaintiff to levy on the contents of a certain safe, and it was claimed that, by covertly and expressively winking, he reversed the meaning of what he said. The jury decided against the wink theory.

The population of the principal cities of Italy is, according to the returns of the last census,

as follows: Naples, 493,115; Milan, 321,839; Rome, 300,467; Turin, 252,832; Palermo, 244,971; Genoa, 179,535; Florence, 169,001; Venice, 132,826; Messina, 126,497; Bologna, 123,274; Catania, 100,417; Leghorn, 97,615; Ferrara, 75,553; Padua, 72,174; Verona, 68,741; Lucca, 68,063; and Alessandria, 62,464.

A writer in *Land and Water* describes an attempt, made in 1870 on a grand scale at the instance of the Khedive, to plant mulberry trees in the Daira, with a view to the creation of a great silk culture in Egypt. Everything favored it, but after a few years the 130,000 trees imported were neglected and then destroyed. "No matter," says the writer, "what it is that the Turk builds or plants, he never repairs or nourishes it."

To the enormous mass of artillery already in her possession Germany is constantly adding more. Since 1871 Prussia alone has added 2,000 guns to her stock. Many of them are of the heaviest calibre. The destination of a large portion of the new guns is the fortresses on the Russian frontier. In each of these strongholds, there are great parks of field and siege guns ready for immediate action in case of war.

The Rhode Island Legislature is being pressed to pass a prohibitory liquor law. The Rev. S. J. Carroll charged that, while the measure was under consideration, the members of the House drank choice liquors set out for them free of cost in the ante-room by the liquor sellers. Senator Stearns replies that no such thing occurred, and that "the State House, from basement to dome, has always been free from taint or smell of rum."

The curious enterprise is being conducted in New Jersey of grinding up worn out India rubber overshoes to make what is called "stock." This material is brought here in barrels and is pressed by the manufacturers into new India rubber goods. A thin coating of fresh rubber varnish makes them look quite equal to articles of the best quality, but they are said to have an outrageous lack of durability.

A party of nearly forty young men, sons of gentlemen residing in all parts of England, left Bristol the other day for New York, on their way to Minnesota, where they are to be placed as pupils with well-known American farmers. They are under the charge of the Rev. G. Pridham, Vicar of West Carptree, who has been induced to promote this emigration by the success which has followed a similar placing out of several of his own relatives.

Queen Victoria is going to make a state visit

to Epping Forest. By the exertions of a few public-spirited men and the corporation of London this beautiful tract of 6,000 acres, within half an hour of the Metropolis, has been rescued from the filching and encroaching landlords in its vicinage, and secured forever as a playground for the people of London, whose toiling East End population can reach it by rail in half an hour for a few cents. It is full of green glades and fine timber.

Henry Shook, a guest at a Toronto Hotel, ordered corned beef at dinner and got a particularly tough piece. Being 84 years old, and nearly toothless, he explained to the waiter that, under the circumstance something tenderer ought to be served. But he could get nothing better, and therefore undertook to eat what was on his plate. Suddenly he fell back in his chair, gasped for breath, and choked to death. A chunk of the beef which he had tried to swallow whole lodged in his throat.

The new fortifications of Strausburg will be completed during the present spring. An idea of their enormous extent may be formed from the following figures: They inclose on the left bank of the Rhine, besides the town and suburbs, twelve Alsatian villages, and on the right bank four other villages with a total superficial area of over 37,000 acres. The distance of the advanced forts from the town is from three to five miles, and the average diameter of the entire works nine miles. The total cost is put down at \$5,400,000.

India tea is growing in favor, but it is probably also increasing in adulteration. Merchants in England are going for it on a great scale. A monster company has been floated in Darjeeling for the growing and manufacture of tea in Sylhet. This is a great district in Bengal, on the Soorma, about a hundred and twenty miles from Dacca, and is said to be peculiarly favorable to tea growing. It is proposed to put \$21,000 acres of land in this cultivation, at the rate of 7,000 acres a year, for the next three years. The vast property is to be divided into gardens of 300 acres each. The project must be either a great success or cause a terrible crash.

Count Geza Zichy, the one-armed Hungarian pianist, has accepted an invitation from the Prince of Wales to appear in several concerts in London during the forthcoming season. The Count, who is now in his 32d year, lost his right arm when a boy by an accident, but his musical performances on the piano-forte with his left hand only are truly wonderful. He performs only for charitable purposes, and he has earned and distributed \$80,000 during the last two years.

It is stated by a French journal, and affirmed in London, that the Prince of Wales paid a visit of eight and forty hours to Paris the other day for the purpose of regulating some financial matters, and that in that time he raised a loan of a million francs. The existence of certain skeletons in the Prince's cupboard, which this loan is intended to cover, is hinted at. A loan of £40,000, however, is but a paltry one alongside of what other English Princes have done.

Garibaldi has improved in health beyond all expectation. He recently took a drive to Monreale near Palermo. The population filled the streets in perfect silence, but uncovered, and they filled the carriage with flowers. To a deputation of the University professors, who said, by their spokesman, that his suffering had made Italy, Garibaldi replied that "Italy was made by the Italians, and when certain gentlemen beyond the Alps say they made it they lie."

The question of an electric railway for Berlin is being considered. The railway would run from the west to the east of the city, and would establish direct communication with the metropolitan railway. It is to be constructed overhead, and supported on high columns. The trains are to lower themselves on arriving at each station to the level of the street for passengers to get out and enter, and will then again be elevated to the level of the line overhead, all this being accomplished by power supplied by means of electricity.

How to prevent the adulteration of food is engrossing the attention of the Massachusetts Legislature. A committee has reported a long bill designed to preserve the purity of both food and drugs, giving a broad definition to the term adulteration, and putting ample powers into the hands of the State Board of Health. That body is to make all necessary inquiries, fix the limits of "permissible variation" from the standard, and establish regulations for examining articles, in order to determine their quality.

A new kind of bomb has been invented at the Krupp cannon foundry. The explosion of these new missiles, it is said, owing to their mechanical arrangements and the materials which they contain, will be equal to torpedoes. At the same works a new cannon has been tested. It is mounted upon a pivot provided with machinery which absolutely does away with the rebound or "kicking." The cannon, moreover, is so fashioned that, notwithstanding its heavy calibre, it can be mounted upon the smallest gunboats.

The mining fever has raged furiously in

Amherst, Mass., and its victims include the shrewdest trade and professional men in town. The source of infection was Col. William S. Clark, late President of the Agricultural College who is regarded as honestly believing in the schemes which he induced his townsmen to engage in. The amount actually invested by Amherst men in nearly worthless mines is placed at \$600,000, which is a large sum for a place of that size. The bubble has now burst, and the Colonel is being sued.

The King of Italy has presented Gen. di Cesnola with a superb gold medal of honor, bearing on its obverse side the royal effigy in relief, and on its reverse side the following inscription: "To General Count Louis Palmi di Cesnola, Discoverer and Illustrator of the Cypriote Antiquities." In the official letter of presentation it is expressly stated by the Prime Minister that the King has caused this testimonial to be designed and executed in recognition of "the honor and lustre" which Italy, his native country, has derived from Gen. di Cesnola's efforts "in the field of science as well as in the battle field."

Scotland can ill afford to lose any more trees at present, says the *London Truth*, for several places have been well nigh devastated by last winter's gales. At Tynningham and Dunse Castle the destruction has been prodigious, and at Luss, Sir James Colquhoun's place on the shores of Loch Lomond, some 6,000 trees fell. Nearly 2,000 trees have been blown down in Queen Victoria's forest at Ballochbuie. The havoc produced in Mar Forest is almost incredible, especially on the north side of the Dee, where the oldest trees were, and there has been a heavy fall in Invercauld Forest.

"Victor Hugo does not" says a correspondent, "look forward to witnessing another birthday. He feels the shadow of the tomb gathering round him, but is not troubled by it. His instinct tells him, he says, that when he passes through the black tunnel called Death he will open his eyes to a higher and brighter existence, and that God will at once receive him as a *maitre compagnon*. Why should he not, he argues, believe in his instinct? Instinct is one of the rare things that never lie. Victor Hugo is happy in feeling that he has taught the world to reverence childhood, because the infant is a sacred being."

The distinguished Milanese antiquary, T. V. Paravicini, has sent a letter to the British Society for the Protection of Ancient Buildings, in which he describes the wanton acts of destruction from which old buildings in the north of Italy have suffered during the past year, and the further injury that is threatened in the

future. Paravicini points out the sad fact that the buildings which have suffered the most irreparable injuries are precisely those that have been under the special care of the Italian Commission for the Preservation of Ancient Monuments, the Academy of Fine Arts, and the universities.

The *Indian Medical Gazette* says that the depressing effects of the famine in 1877 have passed away. The birth rate, which in that year was 16.3 per 1,000, and fell to 11.9 in 1878, is now restored to its normal rate of 22.9. The death rate in 1880 was 15.2 per 1,000, against 53.2 in 1877; a startling difference. Cholera and small-pox were less prevalent in 1880 than for many years past. In 21 districts no deaths from cholera are reported; the total in other districts is 613. The whole number of deaths from small-pox in 1880 was 14,529. This seems large at first sight, but fever was the worst enemy; it contributed 209,940 out of 434,101 deaths.

Tim Poffenbarger was not suspected of any tendency to insanity. He was in successful business at Gallipolis, Ohio, and a social favorite. Yet he committed suicide because he discovered, as he believed, that he was losing his mental faculties. He wrote: "My mind has become so confused that I am not capable of transacting my business, and my life seems to be a burden to me, and my memory so affected that I scarcely know what I have been doing for several months."

The project which was mooted some time ago for constructing a Crystal Palace at St. Cloud on the plan of that at Sydenham has been taken up by the French Government. The Ministers of Fine Arts and Finance have caused to be distributed to the Deputies a bill drawn up with this object. The undertaking is to be managed by a company, and at the end of thirty-six or forty-eight years is to revert to the State. The ruins of the castle of St. Cloud are to be pulled down, and in their place the company is to construct an ornamental building, with a terrace and gallery in which a collection of antiquities is to be exhibited.

The project for constructing a third railway tunnel beneath the Alps under Mont Blanc already meets with considerable opposition, particularly on scientific grounds. Herr Heim, a Swiss savant, of the Polytechnicum of Zurich, contends that the piercing of Mont Blanc would be a work of immense difficulty. In one part the tunnel would have to be cut through a formation of anhydrous gypsum, which swells on exposure to the air, and is almost impossible to stay. Moreover, the temperature of the galleries, judging from the

experience of the St. Gothard Tunnel, would be from a minimum of 86° Fahrenheit to a maximum of 122°.

Some curious old customs are still observed in London on Good Friday. By the will of Peter Symonds, made in the year 1568, sixty of the youngest boys in Christ's Hospital receive after divine service on Good Friday morning in Allhallows Church, Lombard street, a new penny and a bag of raisins. On April 7, after a sermon by the Prebendary, the requirements of the will were, for the 288th time carried out. At St. Bartholomew's the Great, West Smithfield, twenty-one widows visited an ancient tomb in the churchyard, and each picked up a new sixpence. Though the name of the benefactress has been lost, the gift has been observed every Good Friday morning for the last 400 years.

The transit of Venus on the 6th of December will be observed on behalf of the French Government by eight expeditions at the following points: The French Antilles, the coast of Patagonia, Santa Cruz, Chubuth, Chili, Cuba, coast of Florida and the coast of Mexico. The stations selected are situated nearly on the same meridian, and permit complete observation of the entire phenomenon. Astronomers anticipate that this occasion will enable them to determine with an accuracy never before attained the distance of the earth from the sun. The members of the several expeditions are now preparing for their work at the Observatory in Paris.

The library of the late Ferdinand Freiligrath, the German poet, has been purchased by an American, and is now in Boston. It consists mainly of editions of the German and English poets, and the large proportion represented of the latter will scarcely be a surprise when it is remembered that the collector passed many years of his life in exile in England, and had from his youth been a student of English poetry. His translations of Burns, Scott, Moore, Tennyson, Longfellow, and other English and American poets are numerous, and in the main admirably done. The library comprises 67 editions of Goethe, 60 of Schiller, and 20 of Lessig; 40 of Byron, including single poems, 22 of Milton, 24 of Burns and rare, early editions of Shelley, Coleridge, Pope, Scott and Johnson.

Among the most persistent givers of books who ever lived in this country was Mr. Lewis C. Iungerich, who died recently in Philadelphia. He was a Swedenborgian, and became an enthusiastic admirer of the works of that great Swedish Seer. While in the wholesale hardware business in his adopted city he conceived the idea of giving copies of those books

to his customers whenever they purchased a bill of goods. His benevolent habit finally took a broader shape, and he announced in the papers that he would send to any Protestant minister a copy of *The True Christian Religion*, or *The Apocalypse Revealed*, who would send the postage. Thousands took advantage of this liberal offer, and it is stated by J. B. Lippincott & Co., his publisher, that at the time of his death 21,500 copies of the former and 14,500 copies of the latter work had been thus given away.

One of the most astounding things in the religious world is the extraordinary growth of the Methodist Episcopal Church since the opening of the present year. The *Methodist* has been keeping a careful account of the conversions reported by all the churches which consent to send their reports. Thus far 1,294 of the churches have reported that 39,652 persons have been converted since the 1st of January. This is the more wonderful in view of the fact that there are 17,656 Methodist churches, and that the total number of additions to them during 1881 was only 25,892. If conversions and additions go on for the rest of the year as they have begun, the increase will be the most phenomenal on record. The Presbyterian Church, with its 5,598 churches, gained last year 35,344 new members, or only about five-eighths as many as 1,294 Methodist churches have gained since New Year's.

The novel and interesting process announced some time since, in France, by which the wool on sheepskin may be transformed into velvet, is likely to prove of industrial importance. Up to the present time sheepskins, tanned with the wool on, have only been used for mats, linings of coats, &c., and the wool, not having been subjected to any preparation, is always matted or curled. Observing that the innumerable fibres are naturally disposed in the most regular and perfect order, peculiarly fit for velveting, an ingenious chemist conceived the idea of cleansing the skin and wool of all impurities, and of so preparing and dressing them that the hairs would be well preserved and not entangled one with the other—the occurrence of the latter contingency being, of course, fatal to the success of the operation. After long and continuous experiments, success has been achieved, the article produced being alike beautiful and serviceable and destined, it is thought, to become a permanent and important article of manufacture.

AN INTERMOLECULAR THEORY.

PROF. J. C. LITTLE, M. A., Superintendent of County Schools at Markham, Va., writes us,

suggesting the hypothesis of *intermolecular vibration* in air, water, and solids as the probable mode of sound conduction, rather than the hypothesis of corpuscular emissions of an incorporeal substance. He admits that the wave-theory is overthrown and says:

"Your arguments and facts are absolutely conclusive to me that in the transmission of sound there are no waves,—that the undulatory theory is wrong."

Prof. Little, however, in trying to substitute molecular vibration for wave-motion makes no sort of improvement, as we understand him, over the wave-theory except to assume that by getting the physical displacement of particles down finer than waves it may obviate the difficulty. We really cannot see why the almost infinitesimal vibration of molecules might not take the form of undulations as easily as to assume any other form of motion. If a mass of air conducts sound by the vibration to and fro of its molecules, the entire mass of air must necessarily move or stir several hundred or several thousand times a second, according to pitch, whatever form of motion these vibrations take. We fail to see how this can be an improvement upon the wave-theory, or how it helps the locust in shaking four cubic miles of air with its infinitesimal strength. If the Professor means, by "*intermolecular*," that the *material molecules* of the air do not stir, but that an incorporeal *ether* within our atmosphere is that which vibrates, then all right. Such supposition admits the existence of an immaterial substance (*ether*) capable of producing the sensation of sound by its vibrating motion. Then why may not another form of immaterial substance (*sound itself*), according to the corpuscular theory, travel by its own law of conduction, like electricity, through air or iron, and produce the sensation of tone by direct contact with the tympanic membrane? The fact that another substance (*odor*) produces the sensation of smell by the actual contact of its corpuscles with the nasal membrane and without intermolecular vibration of any kind, proves by analogy that hearing is produced by a similar corpuscular process. The truth is, as soon as the wave-theorists admit the existence of immaterial *ether*, to help out the undulatory theory of light, which they all do, they might as well be consistent at once and admit an immaterial substance called *sound itself*, and another called *light itself*, and then take the common-sense view that they both act on their respective organs by the same general law of corpuscular contact analogous to the action of odor on the nasal membrane, and thus do away with all this self-contradictory confusion

about wave-motion and intermolecular vibration.

MENTAL SEEING AND HEARING.

BY REV. THOMAS NIELD.

CONSCIOUSNESS is the ego's cognition of what is *real*. Such is the definition given, for convenience sake, in our former communication. To be more exact Consciousness is the ego's cognition of its own states. We are conscious of existing, feeling, acting. In sleep we are conscious of the activities of the Imagination and the Memory. We seem to be conscious of the reality of their vagaries. But our mental activity is the only thing of which we are truly conscious, since all else is unreal; and we cannot be conscious of what is not, or of the reality of the unreal. So when awake, of that which is objective we know nothing, save the impressions made upon us by the senses. Of the subjective we only know what we feel and do. We know that we have sensations and emotions, that we think, remember, imagine. But we are not conscious of thought, nor of reproductions of Memory, nor of the creations of the Imagination, as entities. They are only the perceived modes of our mental activity, or a concept of the net results of that activity. The main spring of mental activity is the Imagination. This is the creative faculty. It is that quality of mind which makes man a progressive being. It is ever restless, ever assaying. True, it has its hours of *play*, as in sleep, when its activities look toward no definite result, have no serious purpose. In *business hours* it takes the raw material of the actual and, in the loom of ideality, weaves a thousand webs. It makes the poet an architect, who builds his stately monuments and gorgeous palaces of many-towered thought. In the painter, it is a power that infuses life into colors, and makes the canvas breathe. It guides the sculptor's hand, till marble warms beneath his touch and mocks our senses, as it stands a petrified conception, a transmuted thought. It sympathizes with our own lower nature in its wants, and feels the spur of our necessities, and gropes among the possibilities for what will give relief. And hence the numberless devices of inventive skill, designed to utilize material things, and make the most of our surroundings. But the processes are not the entities; nor are the products of the processes, until expressed in outward, sensuous form.

In creation is implied the power to fashion in the mind, to *see* the object we create. A

man invents an engine. He can see its parts of steel, of brass, of belting, all in motion under steam. These substances are not within his brain. What is? Is that elaborated product of his brain's activity created substance? No. A man's creative skill depends upon the quantity, the quality, and the activity of the brain; and when inventing, he must have a starting point besides an object. Guided by the judgment, the Imagination then makes tentative, persistent efforts to *think out* the thing desired; and so keeps working toward the end, until its efforts formulate into a concept of the thing. The concept is the *all* of consciousness—is what he *sees*.

And so-called mental sight is only memory when, for instance, one, where all is dark, can see the contents of a trunk. The mental eye sees only what the physical had seen before. And so the inner eye can never pierce the case of a chronometer, until the outer eye has seen its works.

And now for mental hearing. Take the musical composer. It is doubtful whether one born deaf can think a tune, and so compose. He who composes must be sensitive to harmony in tones, and find a pleasure in the work. Without this pleasure the Imagination will refuse to work, or have no aptitude for it. In working, it creates on the *generic model* of the harmonies that he has heard. Hence, he whose ears have heard the grand productions of the masters, will compose a higher kind of music than the man who has but heard the lowest types of musical expression. Why is this? Imagination, in inventing, takes its cue from Memory, stands on the discovered and, something like "a measuring worm" that seeks another leaf, projects itself in tentative assays to gain the undiscovered. He may *think* the sounds as if proceeding from the flute his child burned up the previous day. But he is far from touching veritable ivories with the finger ends of thought, producing sound pulses to be explained on the corpuscular hypothesis of sound. Men have composed while not a thought has wandered to an instrument. And this is only what the poet does, who sees no written words, and yet whose feats are similar, so similar that Milton says, "Music is married to immortal verse."

In conclusion. If what we see and hear with mental eyes and ears are entities and veritable sounds, there are a thousand different kinds of heavens, a thousand hells, that mental eyes have seen, and each unlike the rest; for heavens and hells are born of our theologies, and often, by the strong imagination, seen. Mental seeing and hearing are the ego's cognizance of the exploits of mind.

REMARKS.

It would be well for Mr. Nield to state definitely whether or not he believes that the soul has real eyes and ears, and what he means by the repeated use of the term "ego." If he denies that the soul or *ego* has real eyes, which we infer from his reasoning, since it does not *really see*, then it is important to know whether he would not deny the reality of the soul itself as an entity. He seems to teach that there is nothing real or entitative about the soul or spirit, since any seeing or hearing by the soul, in case the physical eyes are shut or the body is asleep, is but imagination or phantasy. If the soul really does not see independently, then of what use would be its eyes if it possessed such organs? If it has no eyes, then, of course, it has no other organs or organization. Then, how can it be an entity? If it is an unorganized entity, then it must be an *inorganic intelligence*! But how can it be an intelligent entity without organs through which to exercise its intelligence? If there is nothing *real* in the soul's seeing, and hence nothing real in the soul's eyes, and consequently in the soul itself, the view of Mr. Nield would seem to differ but little from that of Prof. Haeckel, which makes the soul nothing but the play of the physical molecules, and their effect as *motion*. Mr. Nield says that no man can look through the case of a chronometer and see its wheels with his soul-eyes till he has seen them first with his physical eyes and with the watch-case open, thus making the seeing with the soul nothing but memory and imagination. But how did the inventor of the first watch see the wheels, inside the case, running and keeping time before either case or wheels were in existence physically? He saw them just as distinctly before as after the metallic watch was finished; and that ideal watch, before a mechanic had touched the metal to construct its counterpart, was as real an entity,—as real as a psychical creation,—as after it had become a tangible piece of mechanism. We admit that from false education and false surroundings, deformed ideals will grow up in the soul like weeds in a cornfield; but there are none the less real on that account, any more than are the noxious weeds. The incorporeal magnetism, which is wholly intangible, is just as real as is the steel magnet from which it emanates, yet none of our senses can recognize it. The first chronometer, when it existed only as the creation of the inventor's soul, was a psychical entity, and as much a reality as was the soul that created it. To deny the reality of those psychical wheels, while they existed only in the soul of the inventor, is clearly to deny the reality of the soul itself, since it is not tangible

to physical sense any more than were those wheels. Our body is no more real than are the surrounding objects of its environment. Neither is the soul a reality if the psychical objects of its environment are not also realities. That we do not see and touch the corporeal piano physically when the fingers of the soul touch its ivories and the ears of the soul hear its musical strains, as in the case of the composer, is no proof that there is not present a real psychical piano—as real to the soul as the corporeal instrument made by a Chickering or Steinway is real to the body. Hence, the conclusion is, if the soul itself is a reality its psychical environment must be equally real, with equally real soul-organs, soul-eyes, soul-ears, soul-fingers, etc., through which the real soul and its real environment are brought together. We see not how it is possible to deny the reality of the psychical environment without denying the reality of the psychical organism and finally the reality of the soul itself, all because they are equally out of, and entirely beyond, the corporeal realm of tangibility. We are aware that this is going a step farther than others have gone. But how are we to avoid it, if we believe in an incorporeal soul at all as real, intelligent entity? If we adopt a real soul as a substantial entity, we must also adopt it as an organized intelligence, and if it has real organs, then there must be real entities in its incorporeal environment upon which these organs can act, and of which they take cognizance. Either this, or we must abandon all idea of the soul's entitative reality, and with Haeckel relegate the "inner man" to the long list of modern scientific "modes of motion." As there is but one step from the sublime to the ridiculous, so there is but one very brief step from true theology to pantheistic materialism, and Mr. Nield, in our judgment, has come very near taking that step.

NATURE AND REVELATION.

BY REV. J. N. PARR, M. D.

WHEN we speak of Nature, we mean all the works, visible and invisible, in the universe of God. These works have, from very remote ages, been the subject, more or less, of human investigation. As advances were made, and new discoveries disclosed what were supposed to be new facts, were formulated and set down as scientific truths to stand as accepted science until some subsequent investigator comes along, upsets them, and proves positively that something else was the accepted truth of science. Thus investigation has gone on, deepening and widening and increasing with

the years, until at the present, scientific research has reached a point of thoroughness and correctness never before attained.

Investigators properly rank as theistic and atheistic. The former pursue their course into Nature's mysteries "as seeing Him who is invisible," seeking truth for its own sake, and recognizing God as the author of all truth, scientific as well as revealed.

The latter class of investigators have a theory to establish, and to this end and this alone they work. That theory excludes God from the universe and makes blind, senseless matter the author of all intelligence and design. Read their books and one will be struck with the avidity with which they seize every opportunity to slur and sneer at religion, even at the expense of a plain digression from the scientific subject in hand.

Take Buffon, the celebrated natural historian. Gibbon, the great historian of the rise and fall of the Roman Empire; Voltaire, Diderot and D'Alembert of French distinction in literature and science, together with the many more modern scientific lights of that school, such as Darwin, Haeckel & Co., and certainly it would seem that the main object of all their study and writing is to blot forever from the world the idea of an all-wise God, and not to discover, classify and publish scientific truth.

The French savants just referred to were men of ability and distinction, who claimed to be able to teach scientific truth. They conducted elaborate publications, and wrote largely on mathematics and different branches of physical science with an outward show of honesty that would indicate a sincere desire to advance truth, while their real, and we might almost say, their only object was to overthrow Christianity.

Diderot said "I am an atheist and I glory in it." But when his dissolution approached, he sent for a minister and was preparing to make a public recantation of his errors. Condorcet, however, and a few others like him now gathered about, persuaded him that his illness was not dangerous, and that he only needed country air to restore him. He was secretly hurried to the country and there died and as his atheistic friends reported, without remorse.

Hume, the historian, gives a no less comfortable view of the sober, honest thoughts of a godless philosopher. He says "I am affrighted and confounded with that forlorn solitude in which I am placed by my philosophy. When I look abroad, I forsee on every side dispute, contradiction, and distraction, I find nothing but doubt and ignorance. Where am I or what? From what cause do I derive my existence, and to what condition shall I return? I am

confounded with these questions, and begin to fancy myself in the most deplorable condition imaginable, environed with the deepest darkness." *Treatise on Human Nature*, Vol. I., p. 458.

Such are some of the legitimate results of the brightest intellectual attainments in philosophy and science when unaccompanied by the light of revelation.

Considering the definition of Nature given in the outset of this article practically correct, we ask what are the laws of Nature about which we hear so much said, and through and by which the great works of the universe are accomplished? In the sense of qualities inherent in matter, laws or properties impressed on matter, there is no such thing. It is simply the will and voice of God crystalized or materialized with reference to physical things. Their harmonious operation is but the will of God tangibly expressed,—one form of revelation. A correct knowledge of natural or physical truth is not as easily obtained nor as readily understood as of revealed truth, but God is the Author of both.

It is properly conceived that an all-wise Author should not contradict Himself. Revelation says—"In the beginning God created the Heaven and the Earth." And that "God formed man of the dust of the ground and breathed into his nostrils the breath of life and he became a living soul." Some say they have obtained more rational and reliable explanation than this, from the book of Nature. They tell us that matter is eternal and that some time in the very far distant past, by some kind of fortuitous coming together of particles the Sun, Moon, Stars and Earth with all their satellites and with all their beautiful arrangements for day and night and the seasons were effected and organized; that man has his origin at the bottom of the ocean in the little moneron, and had to travel for ages through myriad species of animals, clean and unclean, to reach his present state. We can't help feeling a kind of desire to say, how do you know all this? But it has been demonstrated that the mingling of sea-water with alcohol gave a fleeculent precipitate, which when separated from the liquid proved to be the identical moneron of Haeckel and protoplasm of Huxley—the Adam and Eve of all life, according to advanced modern science. It is but a precipitated sulphate which any chemist can produce at will in his laboratory. This experiment was shown to Prof. Huxley and which forever blasted that scientific delusion. It is claimed by atheists that geology and paleontology contradict the Scriptural account of creation. But the Bible was never given to

teach geology, paleontology, astronomy nor any other branch of philosophy or physical science, and so it is not authority on these subjects. It was intended to reveal moral and spiritual truths. Suppose in those early days before there was any physical science properly so called, and when the world believed in the geocentric system or the physical universe, the Bible had assumed to be scientific authority on all subjects to which it made allusion, and had spoken in strictly modern scientific terms, it is manifest that it would have been wholly unintelligible to the former generations of man. And, perhaps, not much less so to us, as science is continually changing its nomenclature and terms of expression, and God only knows when it will arrive at any definite standard or the exact truth. To say the sun rises and sets was a proper and well-understood expression in the days of Joshua, as well as now; and if he had commanded the earth to stand still instead of the sun, he would have been thought a lunatic and treated worse than Galileo was.

Scientific terms and theories will, perhaps, always be more or less in a state of mutation. Before the days of Galileo the earth was thought to be immovable and the heavenly bodies to revolve round it. Before Dr. Priestley's discovery, in 1774, oxygen and all gaseous bodies were considered only modes of common air. The arteries in the human body were thought to contain air until Harvey made the discovery that they carried the oxygenated blood. Light, heat, electricity and even life have been considered only modes of motion, but now are proven, thank God, in the "Problem of Human Life," to be substantial entities.

The wave-theory of sound, centuries old, taught throughout the scientific world as a settled and unalterable scientific truth is now numbered among the exploded scientific humbugs of the past. Evolution as taught by Darwin, Haeckel, Huxley & Co., and thought by its friends to be impregnable, has also been utterly demolished and its champions are now afraid to open their mouths or make a scratch with their pens in its defense.

These exploded scientific theories are like the devils that entered the swine—their name is legion. Lyell says that in 1806 the French institute named not less than eighty geological theories that were hostile to the Scriptures, but not one of them is held now. The president of the British Scientific Association, and the vice-president of the American Academy of natural science, have admitted that the "whole foundation of theoretic geology must be reconstructed." When scientists agree among themselves it will be time to proclaim a conflict be-

tween Nature and Revelation, and to ask us to lay down our Bibles that have guided millions to the heavenly world and accept their ever-changing theories instead. We are not afraid of scientific *truth*. Let it come. It only adds more light and proves the unity of the Divine Saviour and the Great God of Nature.

When men know the real truths of science and their relation to each other, there will appear no conflict, but the harmonious blending of evidence of the existence and efficient presence of the one Eternal God. Philosophers will then say with David "the heavens declare the glory of God and the firmament sheweth His handiwork." Scientists will join Paul in saying, "the invisible things of Him from the creation of the world are clearly seen, being understood by the things that are made, even His eternal power and Godhead." And all men will say truly, it was a fool that "said in his heart there is no God."

THE CHARACTER OF CHRIST OF SUPERNATURAL ORIGIN.

BY J. W. LOWBER, PH. D.

WHAT think you of Christ? is an interrogation the most fundamental and all-engrossing that has ever been propounded to men. For more than eighteen centuries, it has been the most vital question among all classes. Even unbelievers cannot let it alone, for they feel that their eternal well-being might depend upon a proper answer to it.

We do not understand by Supernatural, something contrary to all means; but that which is superhuman, and above the common laws of Nature. We believe that the Supernatural comes within the domain of law, but it is a higher law than any with which we are now acquainted. All Nature at first originated in the miraculous, and it is impossible for the world to get rid of the idea of miracle. In all this, however, we believe there was profound method. The mission of the Christ into this world was not without means; but it was the grandest methodical arrangement of which man can form a conception.

The Jews did not originate the character of Christ, for it was the opposite of all their preconceived ideas of the Messiah. It arose far above any conception of which the Jewish mind was capable. It could not have taken its origin among the Gentiles, for it was entirely too Jewish for them. That it did not originate with the disciples of Christ is shown in the fact that even after His resurrection from among the dead, it required miraculous power to make them fully comprehend the completeness

of His character. We must, therefore, conclude that the character of Christ was of Supernatural origin, and that it required the Great Artist to present to the world such an original and such a perfect picture.

The teaching of Jesus proves His divine origin. It can not be said of Him that He simply taught good things; for everything He taught was absolutely perfect. At the conclusion of His grand sermon on the mountain, the people were astonished at His teaching; for He taught with authority, and not as their scribes. The first seven beatitudes of that sermon should convince every honest mind of the mission of Jesus. They refer to traits of character and to states of mind; and are paradoxical; for the world's conception of the man who is superlatively blessed has always been the opposite of what is taught in them. The doctrine was new and strange not only to the heathen world, but also to the most cultivated students of the Jewish law. The truth of all these maxims has been fully realized by all that have accepted and practiced them. They make up a perfect character.

The life of Jesus corresponded to His teaching; for He perfectly practiced what He taught. Not a man, among the keen-eyed critics, or the vilest opposers of Christianity, has been able to produce a single instance, where Jesus violated in practice what He had taught. In this Jesus stands alone: for He is the only teacher who has had a perfect practice, and the only one who has practiced what He taught. How account for this without admitting the divine authority of Jesus Christ?

The teaching and the life of Christ have stood the test of time. What has become of the philosophers who were contemporary with Jesus? With the exception of a very few they have gone into forgetfulness, to be heard of no more until the unfolding of the records of the last judgment. What has become of the great statesmen of Greece and Rome? With the exception of a few, they too have passed from the records of time, and have gone into the shades of forgetfulness. What has become of the Jewish doctors, who lived in the days of Jesus? Their names have also perished, and they have left but few foot-prints on the sands of time. The name of Jesus acquires more influence day by day. How understand this without accepting the divinity of His mission!

The admissions of those not favorable to Jesus in His day are sufficient to show that His teaching was of superhuman origin. His question to the Jews about the baptism of John silenced them, and showed that they despised the truth. They admitted that He cast out demons, and tried to explain it away.

Judas, the traitor, understood all the private counsels of Jesus, and he went to the chief priests to confess that he had betrayed the innocent. The wife of Pilate and even the governor himself, pronounced Jesus innocent. After the resurrection of Christ, the guard came into the city to report the fact, and was hired by the Jewish priests to tell an absolutely unreasonable falsehood.

THE ARROGANCE AND THE ERRORS OF MODERN SCIENCE.

BY REV. F. HAMLIN.

AN eloquent Divine of the present century, speaking of the high pretensions of skeptical men of science, has well asked "upon what meat have those Caesars fed, that they assume such lofty superiority?" While men are confessedly fallible in their opinions, judgments, deductions, and conclusions in all other fields of activity and endeavor, it would appear that when one undertakes scientific investigation, he passes instantaneously beyond the line of possible mistake. In medicine, in invention, in art, &c., not only are theories frequently qualified, but they are utterly abandoned so soon as they are proven fallacious or untenable. But the materialistic scientists of to-day are exceptions. *Unprecedented* and *unparalleled* is the self-sufficiency and presumption of these men in their persistent adherence to exploded theories.

Convince the banker that the bill or coin is spurious, and it is at once rejected. Persuade the owner that his house is undermined, and cannot stand amid wind and storm, and he forthwith deserts it. Reveal to the possessor that the supposed diamond is not a real gem, and he refuses to waste time shaping its facets. Exhibit a flaw in the major or minor premise of the logician's syllogism, and he immediately discards the proposition as worthless. Show the discoverer that the vessel in which he proposes to sail for the tropic isles, is unseaworthy, and he at once abandons it; but a Tyndall, a Helmholtz, or a Mayer, when their theories, under the acid test of truthful investigation are proved to be nothing but alloy; when their houses so carefully constructed, tremble on their sandy foundations; and their supposed gem-thoughts appear in their true character, and prove but refuse glass from the theorizer's work-shop;—when Haeckel, Huxley, Buchner, and that class of Materialistic Scientists realize that

"The mistakes of their lives are many," they still cling persistently and desperately to their truthless hypothesis, as does the drown-

ing man to some worthless object beneath the surface of the water, and in so doing only renders death the more certain.

Had the past of scientific research been *freer from gross errors*, we could more easily tolerate this spirit of self-conceit and superciliousness; but when we consider the mistakes of this class of men in "days gone by," how *unreasonable*, yea, how *disgusting* in their sickening pretence to infallibility and wisdom. It reminds us of the wheathead whose very upright position, argues for the absence of the kernel. They seem to forget that *for hundreds of years their professional ancestors held the Ptolemaic idea of this world as "the centre of all,"* until, while Copernicus "explored the fields of Uranic space, the thought of the sun as the real and immovable centre" flashed upon his mind; which view, embraced by Galileo, Kepler, and others, was finally perfected and established by the splendid discoveries of Sir Isaac Newton. They would consign to the tomb of the Capulets the fact that *geology has thus far taken back nearly 100 different theories*; "great bubbles of crude and flighty speculation, launched into the air with infinite parade, admired for a moment by the open-mouthed crowd, and then generally bursting as they disappear." The standard works on Geology twenty years ago are not authority to-day, and nearly every Geologist of the past has abandoned his once most startling theory, and has taken up another. Lyell discards his former views about the age of the world, and the time of man's appearance in it, and as Southall says, "This life is a history of discarded opinions." Huxley claimed millions of years for the earth, and was utterly routed from his position by Sir Wm. Thompson. *Herbert Spencer holds to the theory of force as sufficient to account for the world as it is, and for the origin of the human race*; while Darwin and others, on geological grounds, hold strongly the Scripture view of creation by an infinite intelligence, as in and through Adam. And further, the errors in this direction of naturalistic, scientific thinkers from Count Rumford to Spencer, especially that which considers light, heat, electricity, magnetism and gravitation simply as modes of motion, are ignored and rejected by the intelligent and impartial truth-seeker, in that we cannot conceive how gravitation, which acts instantaneously at all distances, can be motion; and he who reads "The Problem" must see that all ideas of force, independent of a substantial cause, are absurd.

No less patent is the error (and criminal indeed is the inconsistency and dishonor) of these men in still adhering to the "*wave-theory* of

sound," after the hot shot from "Wilford's" artillery have slain it beyond the possibility of a resurrection. Yet with the innumerable blunders and mistakes of the past confronting them on every side, these pretentious advocates, not of theories, but of less, mere hypotheses, stand firm in their practical claim to infallibility in connection with scientific investigation. *The truth is, science is exceedingly superficial in her real attainments.* Munsell has well said "Science is simply systematized knowledge," using that term in its true, generic sense, as contradistinguished alike from crude collections of mere facts, and from unverified hypotheses.

In the field of scientific inquiry but few facts have been discovered. Why, it is not certainly known to-day that one elementary substance has yet been revealed. We are more confident of carbon, in this respect, than any other, but it is readily admitted that even this, may, ere long, prove to be compound.

In the more profound realm of study connected with Cerebral Psychology and Physiology no real progress has been made. How the physiologist traces a ray of light from the external object to the retina of the human eye, and then dilates grandiloquently on the transmission of nervous impressions, from the retina to the brain; but no stretch of his ingenuity can reveal how the nervous impressions transmute in a *thought*. To account for thought as does Cordillac, by calling it a "transformed sensation," is to use words inexplicable and meaningless; for if thought be what he claims it to be, we do not know it, and if we *did*, we could not comprehend either the mode, or the significance of the transformation. So if we turn our attention to the examination of that indefinable something called life, and ask concerning Dereck Hammack, *i.e.*, "the way of the Spirit, and how the bones do grow," science offers no answer. How the spirit of life recognizes itself each time, clothes itself anew, makes the bones to grow, and builds up for itself a new house, science does not explain. Before these problems she stands speechless, like the man who had "not on the wedding garment." She may show how life is affected in its *manifestations*, by outward influences with which it comes in contact, by concerning the subtle, immaterial power itself, begotten with its laws, and its idea Noeron and Energetikon, science knows no more than did Aristotle, or those ancient positivists who talked about Schema, Taxis and Thesis, or those close thinkers of old, "whose better reasoned atheism Cudworth has so fully respected." Science skirting this sea of mystery, can only say with Haeckel, "the ultimate causes are hidden from us."

Surely a class of men, whose knowledge of the superficial, to whom the congelation of the dewdrop is inexplicable, and who, though "light has shone on them for 6000 years, do not yet know the path to her house, and whose past is one line of errors," such men, we say, should not be Johnsonian in their expressions, nor in their claims. Let them remember that *truth* needs no arrogance to support it, Whether it blaze in a furnace, beam in a star, nestle in an atom, flash in a sun, or scintillate in a gem, truth is like God, its author, *capable of standing alone*. There, too, let science never forget that error, even though scientific, *will and must give way to truth*.

A century ago an infidel German Countess dying ordered that her grave be covered with a solid granite slab; that around it should be placed solid blocks of stone, and that the whole be fastened together by strong iron clamps, and on the stone be cut these words; "This burial place, purchased to all eternity, must never be opened." Thus she defied the Almighty. But a *little seed* sprouted under the covering, and the tiny shoot found its way through between two of the slabs, and grew there slowly and surely until it burst the clamps asunder, and lifting the immense blocks the structure ere long became a confused mass of rock, along which in verdure and beauty grew the great Oak which had caused the destruction. Thus truth dislodges error; thus her branches spread in splendor above the ruins of the false, and thus (let Huxley, Helmholtz, Mayer and others beware) "he that exalteth himself shall be abased." In my next I shall consider some needs of Modern Science.

EXPERIMENTS AND EXPERIMENTERS IN SOUND.

BY CAPT. R. KELSO CARTER, C. E.

In the last article we presented the testimony of the organ builders and others to show that the so-called "laws" of resonant tubes are not laws at all; that the length of the tubes is not in inverse ratio to the number of vibrations, and that diameter has an important effect. Just here a very interesting piece of apparatus made by Koenig, of Paris, becomes useful to demonstrate that the proper reason or law for this subject is as yet unknown. The instrument in question consists of a block of wood several inches thick, in which is cut a perfectly cubical chamber of about two inches in diameter. Three pistons, each of the exact size of the chamber, are arranged so as to form three sides of the chamber, and each can at will be

moved into the chamber, thus reducing its volume to any degree required with perfect accuracy. Two sides of the chamber have glass plates for a covering so that the exact position of either piston can be seen and its distance measured, while the remaining side has an organ pipe mouth-piece, arranged to blow into the chamber, and thus use it as a resounding tube. Now if diameter has something to do with pitch the natural query would be—Is pitch proportioned to volume? The above apparatus answers clearly and emphatically *No*. The exact diameter of the chamber is 46-16 inches, and of course if pitch varied as volumes the piston should be pushed in one-half or to 23-16 in order to sound the octave. But it must actually be pushed to 35-16 before the octave will sound or about 7-9 of the entire distance: thus showing that when the fundamental resounds from a cubical tube of a certain length, the octave will sound from a tube of only *one-ninth* that length if the width remains the same. I am not in any way proposing to explain the true reason or law of vibration in these matters, but am rather acting an iconoclastic part with a hope that the facts here presented, which so clearly show the wave-theory to be without foundation, may suggest to some acute thinker the true explanation. Before leaving Koenig's instrument it may be well to state that two of the pistons produce the same effect, while the third, which slides across the mouth-piece or vent, thus cutting off the air supply, will not alter the sound more than a tone. I have already shown that organ builders alter the diameter as well as the length of every pipe, and I will now give the result of a few experiments performed by myself. I procured a fine organ pipe of Koenig's pattern sounding C3 and had a close-sliding piston made for it, so that I could make it a closed pipe or an open one at will. Measuring with my fine scale, I found the length of the open pipe to be 22½ inches. Now according to the wave-theory the length of the closed pipe, sounding the same note, should be exactly one half or 11 1-8; but in sliding my piston to that point I found that it gave a sound between B and B flat, and I was obliged to push the piston in ¾ in. more, making 1½ in. that the "wave" should travel according to theory, but refuses to do so in practice. I found in this experiment that the side valve must be accurately made and of same depth or the result will be uncertain. Still prosecuting the subject, I procured a number of tin tubes, made to lengthen on the telescope principle, and of widely different diameters, and then tried the following experiments.

	Open pipe.	Open pipe.
Fork	1½ in. diam.	4 in. diam.
C3	25.7 in.	24.4 in.
A	14.4 "	13. "
C4	12. "	11.1 "
	Closed pipe.	Closed pipe.
Fork	1½ in. diam.	4 in. diam.
C3	13.2 in.	12. in.
A	7.3 "	6.2 "
C4	6.2 "	5. "

I earnestly ask all candid minds honestly to reflect on these figures, and then answer the query how it *happens* that Prof. Tyndall, Prof. Mayer and others always use a tube whose diameter happens to be such as to give results that seems to substantiate their theory? While it is a fact that a vessel or tube of one or two inches diameter is probably the nearest to hand, yet in the pursuit of scientific truth, one of these gentleman certainly ought to have carried his experiment far enough to include vessels of a wide variety. In a previous article I showed that using a harmonic tube-length as a basis of calculation, a sound velocity of 880 ft. was obtained; a result which was very appropriately styled a "breaker" by the editor of the *Microcosm*. Beyond controversy however, the length of a tube resounding to a fundamental tone is of more importance, and hence we point to the series of successive "breakers" presented by the figures given above, calling special attention to the closed pipe resounding to the C4 fork. A length of only 5 inches multiplied by 4 gives 20 in. for the entire wave length, and that by 512 vibrations gives only 853 1-3 ft. a second for the velocity of sound.

Even to the most unscientific mind the crushing force of this experiment must be strikingly manifest. The wave of sound, by wave theorists, is supposed to go down the closed pipe, rebound from its bottom and return just in time to swell from the fork; and to do this, the distance down and back must be just one-half the length of the sound-wave; and using it conversely the velocity of sound is calculated as already seen. But here is a closed tube resounding to a fundamental sound, having none of the possible uncertainty of harmonics, which gives the appalling discrepancy of 853 1-3 ft. as opposed to 1120 required by the theory. Is it too much to infer that if a tube had been used of a diameter of 5, 6 or more inches, a still more contradictory result would have been obtained? I now wish to propound a question for scientific explanation. When a resounding fork is held over a closed tube of the proper length, the air in the tube resounds in unison with the fork. Wave-theory says the sound is reflected from the bottom of the tube, &c., &c. Now it is equally true that if a

fork be held over the mouth of a tube open at both ends of a proper length, that the air in this tube will also resound in unison with the fork. My query is—*What reflects the sound wave in this case?* There is no bottom to the tube to act as a reflector, and if there were it would be twice the requisite distance from the fork, and there would be no resonance at all. But the tube being open there is resonance, and that just as full and loud as the closed tube renders. We submit that the wave-theory, by explaining the closed tube's resonance by reflection, is in duty bound to explain the open tube's resonance in the same way. Yet strange to say, the pages of Helmholtz, Tyndall, Mayer and others are scanned in vain for the most remote hint of any such explanation. In all reason why is this? Why have these gentlemen seized upon the closed tube and "explained" it in order to demonstrate the wave-theory, and never once considered the open tube? Is this an example of the truth-seeking of science?

Perhaps some one may suggest that the reflection in the case of the open pipe is from the node or point of quiescence in the centre; but even this intangible foundation can not be built upon, because the air on the opposite side of the node from the fork is also in vibration, and it is certainly not "reflected" from the centre. Were there any possible way in which the sound could be reflected from the farther end of the open pipe, we must remember that the length of this pipe is supposed to be one half a wave-length, and therefore a wave entering the tube from the fork, and being reflected back again, would meet the vibrating fork with a direct and square opposition, and the result should be silence according to the theory! This leaves the whole miserable affair in such a pitiable plight that it really seems a matter of regret that the names Tyndall, Mayer, &c., should have gone before the world as teachers of such fearful error under the guise of truth. I expect to show in my next article some startling results deduced from the effects of temperature upon sounding bodies.

PA. MIL. ACADEMY, June, 1882.

A REMARKABLE DISCOVERY.

Croton Falls, May 25th, 1882.

EDITOR OF *The Microcosm* :

DEAR SIR;—Your answer to my query in the May number of your Paper, with reference to the Phenomenon attending the Water Falls at this place, was so clear, and afforded such an admirable solution of the difficulty, that I venture to send you an account of an acciden-

tal discovery relating to the propagation of sound.

My house is connected by Telephone with a neighbor's, who lives distant about a mile. The Instruments are Automatic and Mechanical, and weak without the aid of Electricity. The entire apparatus is very simple, consisting, at each end of the line, of a square box, in which is placed two double concave diaphragms; in the center of these is fastened the Steel Wire which acts as the conducting medium. Speaking into the box at either end conveys the conversation through the wire and it can be distinctly heard at the other end. The wire is supported at intervals of 250 feet, and is insulated at each point of support by metallic loops through which the line passes.

Soon after the Telephone was erected, I was annoyed by a sound of tapping on the wire. In order to remedy the difficulty, I took a walk along the line in company with a friend, and found the obstruction about half way between the two houses, which proved to be the limb of a tree which the wind had forced against the wire. In order to have the use of both hands with which to break off the limb, I held the wire between my teeth, when to my amazement I heard with great distinctness the sound of conversation, and was able to recognize the voices of those speaking in the room at home. I then gave the call, by tapping lightly with my finger on the wire. This call was immediately answered, and I experienced still greater astonishment when I found that by keeping the line between my teeth, and speaking, I could make myself understood at either end of the line, and carry on a conversation in this novel way, as easily as with the aid of a diaphragm. This discovery, which was to me most startling, may perhaps be known to some of the readers of *The Microcosm*. Will you kindly afford an explanation of the manner in which *articulate* sounds, as in the above case, can be communicated to the naked wire, without the assistance of a diaphragm, while at the same time preserving in a most unmistakable manner, the tone, inflection, and general character of the voice of the speaker?

Yours Respectfully,
GEO. F. CHAMBERLIN.

ANSWER.

The above-named discovery is one of the most remarkable upon the subject of Sound that we remember to have heard of lately, and we doubt not will ultimately lead to valuable improvements in telephonic communication. One objection to audible or loud-speaking telephones, for which so many inventors and sci-

entific investigators have been seeking, is the publicity they give to business communications where privacy is oftentimes desirable. With this new discovery we can easily imagine two business men talking together miles apart, in a muffled conversation, each with the naked end of a connecting wire between his teeth, no one but the owners of the teeth being able to comprehend the communication!

But the scientific aspect of the discovery is still more wonderful. What is this *sound* that travels along the metallic substance of the wire, and communicates the very quality of human speech to the auditory nerve from one set of teeth to another? The air-wave theory of sound-propagation, through the bending of the tympanic membrane in and out as the only means of hearing sound, which current acoustics has always taught for true science, weakens down to total inadequacy in the light of Prof. Chamberlin's discovery, and we congratulate him and our readers upon the value of his communication, and the important bearing it will doubtless have upon acoustical science in more ways than one. Who can explain the rationale of this wonderful question of transmitting speech through a mile of steel wire without marring its quality of vocal expression?

"WHO IS THIS?"

BY DR. C. H. BALSBAUGH.

ALL the great questions and the small, if such there be, in relation to God, the universe, man, beast and atom, centre in Jesus, the Christ. "All things were made by Him, and without Him was not anything made that was made."—John i: 3. "The *world* was made by Him."—ver. 10. The world, which the now dead, but still living Darwin and his learned, yet ignorant followers have so grossly and fatally misrepresented, is the work of the eternal, omnipotent Logos, which our mole-eyed scientists try so hard to prove a myth, a non-entity. "By Him were all things created, that are in heaven and in earth, visible and invisible, whether they be thrones, or dominions, or principles, or powers; all things were created by Him, and for Him, and He is *before* all things, and by Him *all things consist*, or *stand together*."—Col. 16, 17. Here is a fair and square issue, one with which scientists are constantly learning and as constantly ignoring; one which is in the very heart of Nature: indeed, *is* its heart essence, life, Alpha and Omega. Here is full play for Tyndall's "scientific imagination," ample room for "the potency and promise" he so inconsistently

ascribes to matter. Here is the real foundation for which Huxley is blindly yet boastfully groping in trying to find a "Physical Basis of Life." Here Haeckel has his twenty-two stages of existence, between the unicellular moneron and man, reduced to one—from God to Adam.—Luke iii: 38. Here the origin and conservation of energy is accounted for on grounds which Nature-worshippers are constantly denying and yet positively affirming. Herbert Spencer must have his great, vast, limitless, awful *Something* in which to hide his ignorance and anchor his faith. Darwin could not get along without a Power that he never found confined in any thing he investigated. Tyndall and Huxley must have their equivalents for the Christ, "of whom, and through whom, and to whom, are all things: to whom be glory forever. Amen."—Rom. xi: 36. A greater than Darwin, Tyndall and Company is here. With all their researches and attainments and speculations and guesses and "scientific imaginations," they know very little. In the simplest things and commonest objects, they stand dumb-founded before impenetrable mysteries. The gaps that yawn between their glimpses of truth and the Great, All-conserving power, they fill up to suit their atheistic conceptions of the Universe. But here is One "in whom are hid all the treasures of wisdom and knowledge"—Col. ii: 3. He has given *proof* of his claims to self-existence, Omniscience, Omnipotence, and Omnipresence, against which the gates of hell shall not prevail. The lens of historic investigation and criticism has brought the Christ of eighteen centuries ago into the ken and consciousness of to-day. That He was, is, and to be, the beginning, end, conservation of the material Universe, is settled on grounds which science is powerless to shake. As well dispute the brief but noble presidency of Garfield. Christ was here and we *know* it as incontestably as we know any undoubted historic fact. And He was here in demonstration to all that is signified by the unapprehended inapprehensible, forever-present, yet ever-retreating Power, which so charms and baffles scientists, since he was unmistakably a man. The two facts cannot be divorced without making the Gospel narrative a blank lie, and all history a fable. Had scientists ever reached the bottom of the simplest fact, the essence of the most familiar phenomenon, they would have a footing for their claims. But in that wherein the Bible claims supreme authority, scientists have never given us the faintest ray of light, the smallest fragment of truth. Where they are bound to stop in all their researches, where they must confess their utter incapacity to as-

sign an adequate cause for what comes within their cognizance, the Bible utters its oracles with all the authority and consistency of omniscient intelligence. It is sheer puerility for Haeckel to run the evolution of man through twenty-two stages, stopping at the moneron, which is born in the nebulous gases of Haeckel's "scientific imagination." And this is science—blatant, quackish, benighting, soul-blasting science. And this is the Bible-scorning, Genesis-deriding, Christ-belittling science which so bewilders and strains and upsets men like McCosh, Cook, Gray, and a lot of others, who have brought shame on the religion of Jesus Christ, and sorrow to many Christian hearts, by their childish concessions to atheistic speculations! Had a single gap been filled up by a single solid fact in the so-called evolutionary creative process, these clerical gentlemen might be pardoned. But when scientists themselves acknowledge that many links are wanting to an absolute demonstration, it seems unaccountably simple for leaders in Christian thought to fall before the confessedly weakest points of the anti-Christian assault. There is nothing more startling and unscientific in ten thousand successive creative acts than in the first; and if the first is a safe theologic tenet, so are any number of divine manifestations of the same character for the same end. "Let God be true, and every man a liar." Nature is His, and all her forces and laws and phenomena; and what she does God does. "By Him *all* things consist." All things in heaven and in earth, visible and invisible, thrones, dominions, principalities, and powers. What force, or energy, or law, or conservation, has the scientist ever met with, not included in this all-sweeping, supreme supervision of the Christ? The whole modern cosmic conception, ~~as represented~~ by Tyndall, Huxley, Haeckel, and other leading scientists, is at best no more than a brilliant, stupendous, bewitching bubble. It starts with dirt and ends with dirt, and is unworthy of mind, and a pitiful derogation of man. It puts the very brutes to the blush, and makes the stones and atoms cry out against the insanity and infidelity of "science, falsely so called." In Christ we have a rational and all-comprehending solution of every problem within the reach of the finite mind. Nothing is left out. The atom owns His presence and power, the Universe is vital with His breath. "He is the wisdom of God and the power of God," and He not only created all things but *upholdeth* all things by His quick and powerful word.

DEAN STANLEY said: "The best remedy for all evils is to look forward."

A WORD OF CORRECTION.

BY REV. D. F. HARRIS.

MR. EDITOR:—In the last issue of the "Microcosm" there is a little paragraph concerning the theological belief of Rev. Newman Smyth—the newly appointed, and recently rejected professor of theology in Andover Theological Seminary. In the paragraph Mr. Newman Smyth is said to be "an outspoken disbeliever in the doctrine of endless punishment for the wicked." Knowing this to be a grave mistake and believing your paper to be conducted on the principles of Christian fairness, I take the liberty of promptly correcting this error before it shall be too late.

As a Congregationalist I have been deeply interested in the discussion concerning the advisability of ratifying Dr. Smyth's appointment. But I now write, not to defend either party at the expense of the other but to show that neither Congregationalist nor Dr. Smyth believe in the doctrine of Universalism. A few quotations from Dr. Smyth's last work—"The Orthodox Theology of To-day"—will sufficiently prove the truthfulness of my statement: "And while there are some passages of Scripture which seems to warrant the hope of final reconciliation, if they are interpreted as literally as are the texts usually relied upon to prove the endlessness of punishment, there are other passages of Scripture which it would be difficult to bend into this theory." (p. 97.) Speaking against the doctrine of Mr. Ingersoll—"that if Christianity could be destroyed, we should lose from the sanctities of conscience man's natural and ineradicable belief in future retribution," he says, "Our faith in future rewards and punishments is instinctive and primary." (p. 109.) Honestly admitting there are some obscure passages, whose meaning is not clear, without denying there are "certain glowing passages in which St. Paul speaks of the final completion of Christ's Kingdom." Dr. Smyth says they "do not teach explicitly a second probation"—they do not "mean without doubt that there shall be a final reconciliation of evil to God; they do not alter the fact that the burden of the Scriptures is the utter urgency of a right moral decision now before the Cross, and they hold up no promise of the hereafter to any man who here and now determines himself against the Spirit of Christ." (p. 125.)

Thus the points against classifying Dr. Smyth as a believer in universal salvation are clearly and satisfactorily stated by himself. The truth is, many have misunderstood Dr. Smyth partly because rejecting the old Calvinistic doctrine that all men who had never heard the Gospel

would be forever lost—he maintains that in the cases of such, God is too just not to give a fair opportunity for salvation: hence Dr. Smyth argues that who ever does not have a fair probation in this life, will in the next: but notice; he does not affirm what will be the issue of that probation: that he leaves with God: while at the same time, he most emphatically believes that all who have heard and deliberately rejected the Saviour here, are without hope hereafter.

D. F. HARRIS.
Cincinnati, Ohio.

SPECIMEN LETTER.

From the Rev. Dr. Lloyd, Ft. Wayne, Ind.

Editor of *The Microcosm*:

I should like to talk with you about your book and paper. To write what I wish to say is beyond my ability and beyond your patience to read. Let me say, however, briefly, that I am a minister of the Presbyterian Church and have been for nearly forty years. Some time ago the *Problem of Human Life* came under my notice in a specimen copy of *The Microcosm*, which was sent me, and I sent for it and the book. Before they came, Dr. M., one of my brethren in the ministry, called to spend an evening with me. I was then engaged in reading your article in *The Microcosm* against the wave-theory of sound. After a talk on other subjects, "what do you read?" the Doctor asked. I knew well his rare ability, clear and logical mind, Princeton training, and sincere love of our venerable standards, or rather the doctrines of the Bible as unfolded in those standards. So I replied, "I am reading what, perhaps you would not listen to with patience. It is Wilford Hall's refutation—his utter explosion—of the undulatory theory of sound, so long and universally taught and accepted by philosophers as the true theory of acoustics, to challenge which they would regard as mere folly of empiricism." "That," he replied, "is what I was taught, and what, for years, I have taught others. I think also, it is easier to declare a theory refuted, than to show it to be so. But what does Mr. Hall say?" I requested him to read the article while I and those present listened. The Doctor willingly consented, and soon he was deeply interested. Now he would stop to ask a question, or make some remark. Then he would listen to some remark from the rest of us. Then at some convincing utterance he would say—"I don't know how to answer that." Anon he would break forth into hearty laughter, at some sally of wit or cutting sarcasm wrapped about with

logic; for the Doctor is a good laughier as well as a good debator. Then he would go back over some argument or statement and re-read it, until finally finishing the whole and laying down the paper with surprise, and pleasure, and triumph written on every feature, yet mingled with some blushing sense of shame, he broke out again and again into laughter, one volley following another, while between breaths, saying: "I give it up,—there is nothing else left me! His facts and logic leave not a shadow of doubt for ignorance itself to hide under. The undulatory theory of sound is mere *sound*—it is lighter than the air on which it is believed to be based and demonstrated." Looking then, at the time which we all had forgotten, it was hurrying on to one o'clock in the morning.

Similar to this experience with the Doctor was my interview afterward with another ministerial brother at his home in Ohio. He is a professor both of Languages and of Natural Sciences, in the College where he resides. He had both your book and your journal, and with all the ardor of an earnest seeker for the truth he had read the "*Problem*,"—yes, once and again had he read it. He could tell me how, when he first received it, wearied with collegiate duties and cares, including the labors of the class-room, he could go to his study, and opening the *Problem of Human Life*, give himself to its pages till the midnight hour. "They had," he would say, "for me a perfect fascination. Almost every paragraph peculiar to his theory was to me a discovery, and every argument a demonstration."

And now, my dear sir, I have written more than four times as much as I had intended to write, having only intended to order another "*Problem*" and *The Microcosm* for Mr. Parker. I am thankful to God for the ability and courage with which He had endowed you so largely, and I pray Him to guide you in their employment as one "set for the defense of the Gospel."

In the cause of the truth, your brother and servant,

J. P. LLOYD."

"KIND WORDS NEVER DIE."

R. S. Ballard, Esq., Waterville, N. Y., writes: "I have waited these many years, and very patiently, for your book, the *Problem of Human Life*; for through all these years I have had an abiding faith that some original thinker of the right talent would come to the surface and spread before the world a complete refutation of the evolution theory. It seemed impossible to me for the theory to be correct,

notwithstanding the semi-indorsement of it by so many of the clergy, and of our prominent teachers in college and university. I cannot resist the impulse to thank you in the name of Christianity, for the service you have rendered the church. Your book was loaned to me some weeks ago. After reading it I ordered a copy, and have presented it to an Episcopal clergyman, who is now reading it. I owe you much for the knowledge I have gained from that masterly work. I think it passing strange that I never heard of the book till within a few weeks since."

Rev. Dr. Wellman, Wyandotte, Kan., writes :

"Last fall I received through the mail a specimen copy of your wonderful *Microcosm*.

"The same day I sent you, according to your offer, five subscribers and received in due time as a premium your very interesting book—the "*Problem of Human Life*." No book ever found its way into my library that is read with such relish and profit as this masterly work. And the query with me and others has been, Who is Wilford Hall? And where has he been these many years that we have not heard his thunder before? I assure you that ten times the price of the "*Problem*" could not take it from my library, not to be replaced. The "*Microcosm*" is a welcome visitor at our house. The only objection I can find to it is, it does not come often enough. You can place my name on your list for another year. I am heartily glad it will be sent out next volume in a more permanent form. I must have it, if it costs \$2.00 a year in place of *only* one. May the Lord help you in your grand work for truth. Cordially,

"W. M. WELLMAN,

"Pastor Pilgrim Congregational Church."

"Rev. Dr. Mitchell, Simpsonville, Ky., writes :

"WILFORD HALL, Esq.

"*Dear Sir*: I have merely sketched the *Problem of Human Life*, and yet this superficial reading has so impressed me with its vast value as a contribution to our current scientific literature that I feel constrained to pen you this hasty note of thanks for the substantial good you have thus done me. *The Microcosm* is just the kind of a bright little paper to go before and herald the coming of the knightly "*Problem*." I am delighted with the *Little World*, and find myself saying, upon the reception of each number,—"*The Microcosm* is just the thing I need!" Don't become impatient. Revolutions are not effected in a day. Your work has already checked the skeptical scientists. Soon they must "call a halt," and then the work of reconstruction of many the-

ories hitherto regarded as infallible will follow. There can be no question but that much that is called science is the sheerest sophistry, and must soon find shelter in merited oblivion. The world owes you a debt of gratitude it will generously accord, though it may find it difficult to discharge. God bless you in your efforts to defend the truth.

J. W. MITCHELL,

Pastor M. E. Church, South."

Prof. John A. Kerby, Flat Creek, Tennessee, writes :—

"My insignificance in science assumes wonderful proportions as I read your masterly productions. No man now living has received such praise from the good all over the world as you are receiving. I hope and pray that these words of praise may not make you vain, but that you may continue humble all the days of your life. This will be your greatest triumph, surpassing even your acknowledged victory over the enemies of religion who are now lying at your feet like lambs dumb before their shearers. Are the subterranean fires of materialism to remain smothered till you have gone hence and then burst forth? I trust not, but that they will break out in all their fury while yet we have a champion able to extinguish them. May your life be long preserved."

Rev. Dr. Hiram Stone, Bantam Falls, Conn., writes :—

"WILFORD HALL, *Dear Sir*: A few weeks since I ordered the *Problem of Human Life* and the back numbers of *The Microcosm*, which I received in good condition. I have read your book with care, having for the past 25 years been deeply interested in the various subjects upon which the work treats. Permit me to express my unqualified approval, as well as my devout thankfulness for its appearance at this most critical juncture when such a scientific defence was so much needed. I am a clergyman of the Protestant Episcopal Church, and as a minister can but feel the momentousness of the conflict now raging. It is appalling to think that some of our greatest scientists are arrayed against the Sublime faith of Christianity, thus degrading man into a mere brute with intellect. We ministers have stubbornly fought atheism and materialism, but our chief assaults have been made from a theological standpoint, and on the authority of Divine Revelation. Glad am I to find that a layman has taken up the contest, and from a scientific standpoint has dealt such annihilating blows at the very foundations of these godless systems of latter-day science. These theories have now met with a defeat from which, I venture the prediction, they can never recover. May

God bless you and your noble production the *Problem of Human Life*. Accept my thanks for the good you have done the world and the encouragement you have extended to me in this, your inimitable work."

Rev. W. B. Hendrick, Atlanta, Miss., writes:—

"Dear Editor: One sample of *The Microcosm* came into my hands. I have been a close reader of the best literature I could find for the last twenty years, but I never saw such an amount of solid reading matter in so small a paper before in my life. Every thinker should have this paper; and if a man who is not a thinker will read one copy of it through, and if it does not make him think, then his thinking faculties must be badly out of repair. Every preacher in the world ought to take it and read it. For God's sake is there not some way to get it scattered through the South? I am at work for a club of subscribers. Hoping that *The Microcosm* will continue to spread till it covers the whole earth.

I am your brother,

W. B. HENDRICK, Miss. Conf. M. E. Ch."

Rev. Dr. J. N. Parr, of Jollietville, Ind., writes:—

"Dear Brother Hall: God bless your *Microcosm*. It is such a solace to our hearts to see scientific thought rising so grandly and efficiently to the support of our holy religion. Through God, I feel that you removed the chief obstacle to the onward march of Christianity. Again I say, God bless you and your paper."

Rev. J. Boyd Espy, Sheakleyville, Ill., writes:—

"I inclose \$2 for the *Problem of Human Life* and your monthly. *The Microcosm* is a marvel to me not only in cheapness of subscription, but in cogency of demonstration, lucidity of statement, chasteness of style, and gracefulness of diction. I feel in reading it that I am feasting on "fat things."

Prof. A. L. Hutchison, Morrison, Ill., writes:—

"I hope you will pardon me for sending my photograph, in my anxiety to secure yours. I have been a student and teacher of the Physical Sciences for some years, but I find the richest food for the mind I have yet found, in your *Microcosm*. Go on in your grand work, and may God bless you."

TYMPANIC VIBRATION.

THE scientist of acoustics teaches, as one of its fundamental principles, that it is only by the vibration of the tympanic membrane, or as

it is called by Helmholtz, the "drum skin of the ear," that sound can be heard; and that the office of the membrane is to bend "once in and once out," as Prof. Tyndall expresses it, as each sound-wave strikes it, thus conveying the sensation of tone to the brain by vibrating the auditory nerve. Now it is plain if this membrane vibrates at all by the action of sound, it can only do so on the principle of *sympathetic vibration*, or by means of the same influence which causes one string to vibrate when its unison neighbor is sounded. This is so entirely self-evident that writers on acoustics have never called it in question, notwithstanding the manifest and insurmountable difficulty which it presents in the way of the current theory. Even as profound an investigator as Helmholtz was so wedded to the wave-theory of sound and considered it so indubitably settled as science, that in the most unaccountable and superficial manner he took the question of tympanic vibration for granted, without a thought of the numberless impossibilities and absurdities which it involved. He admits in his writings in various places, as quoted in the *Problem of Human Life*, that two strings or membranes will not vibrate by sympathy unless they are tuned in *unison*; yet here he teaches, because the received theory of sound happens to require it, that the membrane of the ear vibrates to any sound whether in unison or not, and as well to one sound as to another, since all sounds are heard with about the same distinctness so far as the most careful observation shows.

But what is more disastrous to this theory, based as it is on the assumption of tympanic vibration, is the fact that the membrane, but *one-third* of an inch in diameter, is more than six times too small to be tuned to the tone of the low notes of the piano! No membrane of that size of whatever material, could be so tuned, or within six octaves of it. Yet it is well known that no membrane or string will vibrate sympathetically to a pitch of sound *that it is not itself capable of producing*. This is a law in acoustics which no one who has the most elementary knowledge of the science will question. Yet this tiny membrane, without the slightest reference to its difference of size and tension in different persons, vibrates *sympathetically* (!) to tones seven octaves or more away from its normal or vibrational number; and so wonderfully is this executed that, contrary to every known law of acoustics, all kinds of ears, with all sizes and kinds of drumskins, hear the sounds with the same pitch and intensity! But the culmination of absurdity presents itself when it is made known that the wave-theory teaches with the same degree of

positiveness. that *Corti's infinitesimal arches*, in the inner ear, also vibrate to all kinds of sounds in unison with the tympanic membrane's oscillations, and by the same sympathetic action as that which, contrary to all science and reason, starts the drum-skin of the ear into motion. Yet these microscopic rods discovered by Corti, are but about the one 300th of an inch in length,—more than one hundred times too small for any tone ever heard! Startling as it may seem to a mind not already poisoned by the stupid nonsense of this self-stultifying theory, Helmholtz, Tyndall and Mayer all teach that these rods can have the same vibrational number as that of the lowest chord of a piano or the head of a bass drum!

This one difficulty, if there were no other in the way, proves beyond a doubt that the tympanic membrane and Corti's arches do not and cannot vibrate as the result of external sounds, and were not intended by Nature to so vibrate as the means of conveying auditory sensations to the brain. Numerous considerations upon this phase of the wave-theory are presented in the work named above, in which it is demonstrated that no vibration whatever takes place in the drum-skin of the ear as the means of hearing sound, and consequently that the wave-theory which teaches tympanic vibration as an essential part of the doctrine of acoustics, must break down.

But we have other proofs that go to corroborate this general argument against the received theory of sound, and which show that the office of this membrane of the ear is not to vibrate, but to temper sound by distributing it over the delicate appendages of the auditory nerve, and thus protect them from injury by sudden and very intense sounds. A case was recorded about two years ago, in the *Medical Brief*, as reported to us by Dr. C. A. Battle, of St. Louis, Mo., of a man whose name and address was given, who had both of his tympanic membranes ruptured by the sound and concussive shock of a nitro-glycerine explosion. The shock was so intense that for some time after the explosion the auditory nerve was paralyzed, leaving him entirely deaf. On medical examination it was found that the drum-skins of both ears were destroyed, exposing to view their internal organs. But in time the paralysis of the nerve passed away, and when the report was published the man could hear with much more acuteness than he could before the accident, and with more sensitiveness than ordinary persons. If the vibration of this membrane is the means of hearing, as the wave-theory teaches, why did not this man continue permanently deaf after his tympanic membranes were destroyed? And why did he final-

ly, after recovery, hear sharper than before?

Another proof to the same effect is the well-authenticated fact that persons born without oral apertures to the brain, have been caused to hear ordinary conversation by means of the *dentaphone*, an instrument which conveys the sound to the auditory nerve through the medium of the *teeth*. Our attention has been called to cases of this kind by Rev. C. E. Harroun, Jr., of Flemingville, Iowa, in which hearing has been experienced by this means in the absence of any sign of an external ear. But even stronger proof of this fact, that the vibration of this membrane has no necessary relation to the fact of hearing, is the discovery of Prof. Chamberlin, as narrated by him on another page, in which the sound is conveyed to the brain through the teeth by a process which precludes the possibility of any sort of vibratory motion,—not even that produced in the dentaphone by the act of speaking to it. One has only carefully to note this discovery to be convinced.

Thus is the general argument confirmed that the vibration of the tympanic membrane by the compact of air-waves is not essential to hearing, and consequently that the wave-theory, of which this is an essential part, is false. Hence the whole scientific world has for centuries been laboring under a delusion in believing and advocating the undulatory theory of sound, since it was never called in question or even doubted till it was first assailed in the *Problem of Human Life*. We do not refer to this fact to claim a credit which no one disputes, but to call attention to the singular silence of the three great authorities on sound—Tyndall, Helmholtz, and Mayer—whose writings are especially reviewed in the above-named book. We believe we are justified by the facts in asserting that neither one of these writers dares to controvert those general arguments, some of the details of which, we are free to admit, are defective and need revision, because the question was entirely new to science at the time that book was written, being discussed for the first time by a man without any previous experience in such investigations. It would have been more than a miracle if no defects had found their way into such an elaborate and extended series of criticisms. But we believe that a sufficient number of those arguments against the accepted theory of sound are clearly invincible to impale it beyond the hope of resuscitation, and to destroy the arguments in its favor massed by the three eminent authorities examined. We believe, further, that they know it, as they have each had a copy of the work. They are also aware that the book, if erroneous, is sufficiently powerful and plausi-

ble to poison the minds of thousands of professors and scientific students of our colleges, causing them publicly to renounce the wave-theory of sound, and to denounce the works of these very three scientists as egregious nonsense, since they have had the proofs over and over in this paper. Why, then, have they not the courage, not to say humanity, to come to the rescue, and save these misguided professors and students from scientific error by exposing and exploding the arguments of that book, if they honestly regard them as fallacious? But, on the contrary, if they regard them as unanswerable, which we believe most firmly to be the case, why do they not show the manliness, as candid scientific investigators, to abandon the current theory as erroneous, and at once inaugurate means for having a reconstruction of the present system of acoustics upon a better basis?

Had Tyndall or Helmholtz made this discovery, that the current theory was a mistake, and that the scientific world was now and had always been wrong on the subject of sound-propagation, the bare announcement of such a revolutionary discovery in natural philosophy from such a source would have set the scientific world in a blaze of excitement, and in quarter of the time, since the "Problem" was published, every college and university in this country and Europe would have been teaching the new theory of acoustics, being supplied with text-books by the Appletons, Harpers, and other leading houses who would have been eager competitors for the privilege of bringing out such an important scientific work! Yes, and we have the best of reasons for knowing that the chagrin felt by these same great physicists, at the fact of an obscure writer making the discovery and thus forestalling them, is the principal motive of their dogged silence upon the subject, after they have become convinced, as is undoubtedly the case, that they have all their lives been teaching the most evident errors for acoustical science! We have every reason to believe that Prof. Tyndall would this day give all the other scientific honors he has ever received or earned for the single conceded claim to having overturned an established theory of science never before called in question. To have exploded his own writings, and abandoned the theory he had labored so hard to defend, could have been easily brooked, and would have been a pleasant recantation. But to admit that an obscure writer had made such a discovery and demonstrated the very foundation of his great book on sound to be false, seems to be deeper humiliation than he has the force of character quietly to submit to. The thought that a man, never before heard

of, should prove the discoverer of such a revolutionary principle in natural philosophy, right in the midst of the acoustical investigations of such distinguished physicists as Tyndall, Helmholtz, and Mayer, overturning all their text-books on sound, becomes a serious matter to contemplate. Hence the great acousticians of the country, especially those who have written on sound and thus unfortunately committed themselves to the wave-theory, have closed their mouths as by concert of action, and for two long years have been gazing at each other in blank silence, apparently in hopes that the thing may blow over, or perchance may turn out to be but an ugly dream! But if the writers who have hitherto shaped the education of the colleges of the world upon this subject are imagining themselves in dream-land concerning this attack upon the wave-theory, they will wake up some of these days with one of the worst scientific nightmares they have ever experienced. This silence-dodge is about played out. Too many young and rising investigators are coming upon the stage to allow such a discovery in acoustical science, if it be one, to be smothered in its swaddling clothes. And tens of thousands of others are hearing the revolutionary news through the columns of *The Microcosm*, and are beginning to ask one another and ask their teachers, What is the matter with Tyndall, Helmholtz, and Meyer, that these convincing and apparently unanswerable arguments of the *Problem of Human Life* and *The Microcosm* against the received theory of sound are not met? Among these young students are as bright geniuses as those who now dictate text-books to our schools and universities, and who will soon begin to investigate and think for themselves, and will then spurn with contempt anything, whether it be called science or not, which will stand the crucial test of thorough investigation and experiment. Then will those now silent authorities be brought before the tribunal bar and be forced to give an account of their stewardship.

One, only, of the three authorities referred to is an American, whose portrait and biographical sketch appear in this number of *The Microcosm*, and it is a matter of humiliation and profound regret, for the credit of the Yankee nation, which was never known to show the white feather, that this popular representative of physical science in this country, directly across the river at Hoboken, N. J., dares not to say his soul is his own on this question of acoustics, nor to attack the "Problem" in which every thing he has written in favor of the wave-theory has been torn into shreds, and flung into his teeth half-a-dozen

times in this journal. He has been offered over and over an equal amount of space with the editor to discuss in *The Microcosm* the wave-theory as taught in all the schools in the world, and by which opportunity he might reach once a month more than a thousand colleges, universities, and high schools where this paper is taken and read. To say that he does not desire to be heard or read by these tens of thousands of students, when he takes such pains to publish his carefully prepared papers on the "Antenæ of the Mosquito" in the *American Journal of Science*, of comparatively limited circulation, is simply nonsense. We know he would only be too glad to be heard, if it were safe. But he dares not to risk being heard in the columns of *The Microcosm*, nor dare he write and publish one syllable in any other journal against the arguments of the *Problem of Human Life*, lest it should form a text for *The Microcosm* which would fasten the eyes of scientific students upon him, and thus force him to defend the wave-theory or ingloriously retreat! We have said these things in a blunt way, because we mean every word we write, and shall send a copy of this paper to Prof. Mayer and Prof. Tyndall, so that they shall be left without excuse. If there is the least bit of fight in those great champions of modern science (and we know there is plenty of fight in them when it is safe) we promise our readers to worry it out of them, and if possible make the coming second volume of *The Microcosm* one of the liveliest battle-fields that has witnessed the clash of scientific arms during this century. Truth needs to fear nothing in such a conflict. The public is now keenly upon the alert to see which party to this controversy fears the light; and mark our word for it they shall see.

THE CHARGE OF "PANTHEISM."

IN a recent number of the *Texas Christian Advocate*, published at Galveston, the editor took occasion, in reply to a correspondent, to commend the *Problem of Human Life* very highly with the single exception of its "pantheistic" teaching! Among his kind remarks are the following:

"The book is fresh, vigorous, and remarkable for the originality and learning of its author. It deals with scientific problems of the most intricate character, and seemingly with ease and confidence. It flails, bruises, and demolishes evolution until it excites one's sympathies for Darwin, Huxley, Tyndall, and their satellites—purely because they are human, and not from any respect for their atheistic theories of science. He is not less severe on what has been termed Christian [or

theistic] evolution. One can hardly read the book, and not feel a rising contempt for that misnomer—"Christian Evolution"—and the compromising, cowardly authors of this new theology."

What a pity, after such a splendid commendation and in such elegant language, that the editor could not have been satisfied to stop there! No objection at all to the book, with the exception of the one single "dead fly in the ointment"—its *pantheism*! On receiving this notice, through the kindness of the Rev. Dr. B. F. Kavanaugh, we wrote the following letter to the editor of the *Advocate*, with a request that he print it, which is all the reply we have to make to this oft-repeated, most unfounded, and we may add ridiculous charge of "pantheism":

EDITOR OF THE *Christian Advocate*:

DEAR SIR:—Rev. Dr. Kavanaugh has sent me a copy of your paper containing a criticism of my book in which you speak favorably of it, with the single exception of its "pantheistic" teaching! I am astonished at this misconception, since no writer, living or dead, has ever labored harder than I have done, all through that book, as well as through *The Microcosm*, to urge and demonstrate the great central truth of the universe,—the existence and immanence in Nature of an All-wise, *personal intelligence* known as God. This Being, as we have urged in all our writings, is not the *natural universe*, as pantheism teaches, but is *above Nature*, *prior to Nature*, and *independent of Nature*.

As to the origin of the natural universe, that is vastly another thing. Whether material things were made by God out of *nothing*, or whether He made them of "things which do not appear,"—in other words of an atom, so to speak, of His own substantial being, is a matter for philosophical discussion, and in no possible way involves the doctrine of pantheism which admits of no Deity save the natural and tangible universe itself. I make this distinction between God and His works in various ways in the third chapter of the "Problem," and I fail to comprehend how any one can carefully read that chapter and still charge the author with "Pantheism." I quote, in the second chapter, passages from Joseph Cook's works, in which he distinctly avows precisely the same views that I do, namely, that God did not create all things out of *nothing*, but that He evolved or made them from himself. No one pretends to charge Joseph Cook with pantheism for teaching exactly the same thing I teach! But some how or other, because I thought it more rational to believe with the Boston Lecturer than to believe in the possible conversion of *nothing*

Maryland, Westminster College, Mo.; Pennsylvania College, Gettysburg; Lehigh University, at Bethlehem, Pa., &c. He is now the highest authority on sound, light, heat, electricity, magnetism, and allied questions of physical science in this country, and stands only second to Prof. Tyndall, of England, and Prof. Helmholtz, of Germany. He and his friends claim that he has made several important discoveries in the science of acoustics, all based, of course, upon the accepted wave-theory of sound. But as there has recently arisen serious doubts of the truth of the theory itself, it greatly disparages the probable importance of the discoveries claimed to be based upon it. Certain it is, if the wave-theory shall ultimately be abandoned, as seems probable in the near future, more than nine-tenths of all the so-called acoustical discoveries of this age, by such distinguished scientists as Mayer, Tyndall, Helmholtz, and their collaborators, will thereby be exploded as no discoveries at all, but mere mistaken inferences drawn from erroneous premises. Such a revolutionary overturn will play havoc with a good many reputations that have shone brightly in the annals of physical research.

A PLEASANT SURPRISE.

Mr. M. C. Tiers, one of New York's best artists, gave us a very pleasing surprise the other day by bringing to our sanctum a life-size oil painting of the Editor of this paper, which is the finest portrait, artistically speaking, that we have seen in many a day. Mr. Tiers is a genuine artist, and if there are any better portrait painters in this country we fail to know of them. The painting was made from one of Bostwick's photographs, which hundreds of our readers have already received as a memento, as suggested by Mr. Williams, on the eighth page of this paper. The likeness is precisely the same in the painting as in the photograph, with the advantage of life-size and color. We had no idea that it was possible to take a small photograph and reproduce from it a life-size oil painting so absolutely exact as this. Indeed we seem to be looking into a mirror every time we see it.

And now we feel it but doing the right thing, in return for such a beautiful present, to say that Mr. Tiers will produce such a painting for any one, life-size (canvases 25x30 inches), and send it by express, prepaid and safely boxed, to any person for \$20. All he requires is the photograph, and a statement of the color of the eyes, hair, general complexion and clothing. We have no hesitation in guaranteeing for Mr. Tiers that any work he may do will give the



PROF. ALFRED M. MAYER.

A. WILFORD HALL.
Very Truly Yours,

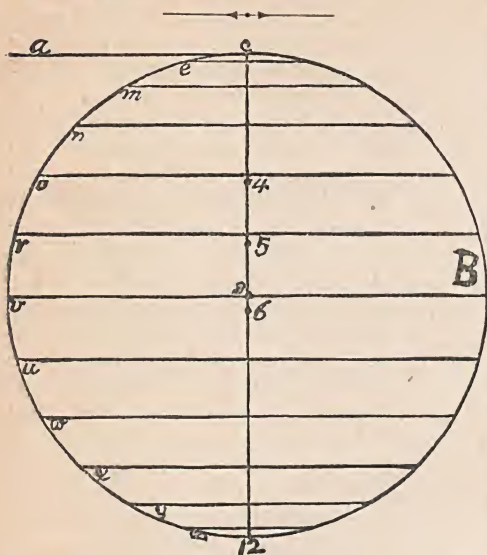
"If any one is capable of believing that God took 500 pounds of *nothing*, more or less, out of which He made Huxley's *orichippus*, he is at perfect liberty to do it. But if you prefer to accept, as a less difficult mental operation the idea that God made that and all other animals out of the invisible substance of His omnipresent being, without in the slightest detracting from His own Almighty and independent personality, it is hardly fair to charge you with 'pantheism' for so believing."

By printing this letter you will be doing a simple act of justice,

We give herewith a brief sketch of Prof. Mayer, with a very life-like portrait, pronounced so by himself, and from a photograph which he sent to us for the purpose.

Prof. Mayer was born in Baltimore, Md., Nov. 3, 1836, and consequently is now 45 years old. No other scientist in this country has attained at his age so wide a reputation as an investigator of physics. His treatises on Sound, particularly, have been regarded as very exact and carefully prepared. He is now professor of Physical Science, and has been for some ten years, in the Stevens Institute of Technology. Before this he had occupied the chair of Physics, Chemistry and Astronomy in several Colleges, among which were the University of

most complete satisfaction. Any one who will send him a commission through us, we will take pleasure in seeing executed.



NEWTON'S BROKEN "YARD-STICK."

SEVERAL friends have requested us to give a diagram illustrative of our explanation of the moon's fall from its tangent as given in last month's *Microcosm* in reply to the *Christian Standard*. We comply with this request and will have to repeat a few of the points of that argument in explaining the diagram.

The circle *B*, represents the moon's orbit with the earth in the centre at *s*. We suppose the moon now to be at *c*, passing along its orbital path *e, m, n, o, r, &c.* These equidistant steps must of course be taken by the moon substantially in equal times. This curved path of the moon is caused by the attraction of the earth constantly and uniformly pulling the moon from its rectilinear course. The line, *a, c*, is a tangent drawn from the moon's orbit at the point *c*, and shows the rectilinear course the moon would pursue if the gravity of the earth were at that instant to be cut off. We are now prepared to comprehend Newton's demonstration. He first assumes the permanent or fixed tangent, *a, c*, from which to measure, and then assumes that the moon falls toward the earth or leaves this line vertically, in following its curved path, at a rate of acceleration or increase of distance corresponding exactly to the acceleration of the fall of a stone on the earth's surface, only the moon's fall from its tangent is but the one 3,600th as much as the fall of the stone here in the same time. In this way it is aimed to show that the earth's gravity is but one 3,600th as strong at the moon's orbit as at the earth's

surface, and hence that the gravity of the earth decreases as the square of the earth's radius, counting the radius 4,000 miles and 60 of these radii from here to the moon. This ratio of decrease in the earth's gravity we have denied from the start of this controversy, and it is the chief point of our attack upon Newton's law. As the demonstration here stated, concerning the moon's fall from its tangent, is also the chief ground upon which Newton undertakes to show this ratio of gravity decrease, it follows, if this so-called demonstration should break down, that Newton's law is virtually shattered. The question, then, upon which Newton's law stands or falls, is the truth or fallacy of this demonstration as presented in the above diagram.

First, then, as to the true and undisputed ratio of *acceleration* of a stone's fall here. What is the mathematical law? It is, that for any period of time selected (as for instance one second), a stone will fall, as determined by experiment, a certain distance. For the next equal period it will fall exactly as far as during the preceding period with twice the fall of the first period added. For the next period it will fall exactly as far as it fell during the period last preceding it, with twice the fall of the first period added, as before: and so on for any number of falls through equal periods of time. Or in other words, each succeeding period of fall increases in distance over its predecessors in the ratio of 1, 3, 5, 7, 9, &c. To illustrate: a stone falls 16 feet the first second. It falls 48 feet the next second, which is the same distance as in the preceding second (16 feet), with twice the first fall (32 feet) added. It falls 80 feet in the *third* second, which is just as much as during the preceding second (48 feet), with twice the fall of the first second (32 feet) added; and so on for any number of seconds, as long as gravity has scope to act with its full power. Now, does the moon really fall, as measured vertically from the tangent *a, c*, in conformity to this law? If not, then the geometrical formula of Newton, as illustrated above, breaks down, and with it his renowned demonstration goes to pieces. We assert here, that the moon does not fall in accordance with this law, even after the false assumption of a fixed tangent is conceded, and has no natural or geometrical relation to it, as a pair of dividers will show. Take, for example, the equal periods of time as marked off around the moon's orbit, and note the first fall from the tangent to *c*. The next fall from *c* to *m* should be the same as the first with twice the first added, which, we admit, happens very nearly to agree, owing to the accidental relation existing between the curve and the tangent, causing about

such an angle this near its commencement. But take the next fall, from m to n , and according to the mathematical law, it should be exactly as much as the preceding fall (e to m), with twice the first fall, from tangent to e , added. But so far from holding true, the dividers reach the dot at 4, thus overlapping the line and shattering Newton's formula, and with it proving his "demonstration" to be a mathematical fallacy. Take the next fall of the moon from o to r , and if there were any truth in Newton's assumed demonstration the distance passed over would be exactly that of the preceding fall from n to o , with twice the first fall (e to e) added; whereas the dividers overlap still more and touch the point at 5. In the next fall it gets worse, reaching the dot at 6. Then the next fall of the moon, from v to u , is precisely the same as that preceding it, *with no acceleration at all*; while the next, from u to w , *gets shorter than the preceding, thus retarding instead of accelerating*; and then each fall thereafter becomes less and less in distance from the tangent, decreasing in the same ratio as these falls increased on leaving the tangent! This ill-contrived "demonstration" thus explodes itself before it reaches its third step, and, as a fitting culmination to such a geometrical monstrosity, the moon's fall, after it reaches 12, begins to become *retrogressive*, actually going in the opposite direction! Yet it has the same natural or philosophical relation to the earth's attraction of the moon when measuring toward this fixed tangent as from it. There is just as much scientific significance in this accidental "demonstration," with the moon going one way as the other; that is, no significance at all, because the tangent itself, as a geometrical standpoint, maintained even for a single second, is a pure, arbitrary invention, without warrant in science or reason. The more we consider this want of all natural relationship between the moon's uniform fall by the force of gravity from its constantly changing rectilinear course and the meaningless assumption of a permanent tangent from which to take measurements, the more we are astonished that any scientific mind could have fastened upon such a chance coincidence, and then seriously based upon it one of the principal so-called demonstrations of a great mathematical law.

One correspondent writes that we misunderstand Newton. That he did not intend this law to apply to the moon's fall except during the first few seconds, or one second for that matter, and never thought of continuing it down to the first quarter, or 90°, where there is no acceleration at all! That is, Newton had a right to use the "yard-stick" just as long as it exactly fitted his piece of cloth to be meas-

ured, or as long as the cloth and the stick happened to come out even; but as soon as his cloth stretches so as to be too long for his measure, then he had a right to lay aside that yard-stick and get a new one to fit it! Yet this thimble-rigging with the science of geometry is called a "demonstration."

It is plain that this whole assumption concerning the moon's fall from a fixed tangent is based on the supposition that as long as this accidental acceleration of the moon's fall from the tangent keeps pace with the ratio of acceleration of a stone's fall here, the tangent may be maintained as valid; but as soon as the moon's rate of fall comes short of the stone's rate, then the "law" requires the abandonment of the old fixed tangent and the striking of a new one! And so on entirely around the orbit, thus changing the fixed tangent to suit the "demonstration" 1000 or 1,000,000 times as the case may require, in one circuit of the moon! A most wonderfully accommodating law this, which submits to be manipulated to suit the demonstration, whenever said demonstration will not behave itself! Now we protest that if Newton had a right to shift this fixed tangent to a new part of the orbit whenever the moon should rebel against the formula and quit accelerating as rapidly as required (which it does soon after leaving e), then we have an equal right to strike a new tangent every thousandth part of a second, and finally *every instant of time*, and thus make the moon's so-called fall from its tangent what it actually is — an absolutely uniform motion from its ever-changing, ever-progressing tangent or rectilinear tendency, without any acceleration whatever.

THE CHRISTIAN STANDARD.

THE young editor of the *Standard* is one of the most unhappy men now in journalism. *The Microcosm* seems to be his irrepressible bane. He swallowed the "bait" we threw out in the May number on the accelerated fall of the moon from its tangent without knowing there was a very sharp hook attached, and saw himself dangling by the gills in the June number in a most pitiable condition, having no reply to make except to refer to the argument of a certain writer who came to his assistance signing himself "K," and who stands in need of the same sympathy. Our argument in the last *Microcosm* was just as effectual an answer to "K" as if it had been purposely designed for him, though we had not then seen his pedantic fanfaronade. Those who have seen it will please read "Newton's Broken Yard-stick" in this paper and see every point he

made wiped out. As a fair offset to this *Standard*-assistant, we give below a note just received from another K—Prof. I. L. Kephart, A. M. of Lebanon, Pa., who is not afraid to sign his name :

A. WILFORD HALL, Ph. D. :

DEAR DOCTOR :—I have carefully read both the May and June numbers of *The Microcosm* and am quite sure that you have not only broken Newton's "yard-stick," but that you have most effectually answered Prof. Goodenow, Prof. Hornung and the *Christian Standard*. Your reply to Prof. Goodenow in the June number is complete. Its irresistible argument centres in the paragraph where you say : "But with the earth as now situated, coming clear up to the body at 1, and filling the entire space from there to the centre, *there is no first unit of free space and consequently no true principle of squared-distance-inverse can come into play in the removal of the body from 1 to 2.*" Allow me to congratulate you and *The Microcosm* upon the fact that President DeLong, of Lebanon Valley College, has this day in the presence of a large Assembly, upon the recommendation of the Faculty and by the authority of the Board of Trustees, conferred upon A. Wilford Hall of New York City, the honorary degree of Doctor of Philosophy. I was present on the occasion and was a deeply interested and highly gratified eye and ear witness of the event. I regard it as a fit recognition of your honest and fearless defense of what you believe to be scientific truth against error, and a just reward of unassuming merit.

Sincerely Yours, I. L. KEPHART.

Then to offset the petulant assaults of this young and ambitious scientist of the *Standard* (for it is manifest that the Editor in chief has nothing to do with such criticism), we have the satisfaction of receiving the following unqualified indorsement from Eld. W. L. Butler (of the same denomination), Editor of the *Apostolic Church*, an ably conducted church journal at Mayfield, Ky., whose opinion, with those who know them both, would more than counterpoise that of a thousand such lightweighters as the "scientific editor." He says :

"DEAR BRO. HALL :

The Microcosm for June is just received. Your paper and book have already effected a mighty revolution, and are destined to still greater and more glorious achievements. Though at times the matters discussed are too heavy for me, I must confess that you have led me into much useful light. I am very much pleased with your methods of warfare. Your points of attack are few and simple, which gives you much strength. The infidelity which is supported by modern science is now a conclusion without a premise. *It must die.* I will call attention again soon in the *Apostolic Church*, as I feel this to be due to your great work. Fraternally and Truly Yours,

W. L. BUTLER."

The Editor in chief of the *Standard* some time ago, in reviewing the "*Problem*," also indorsed the author in these words :

"The scientists who have dealt so flippantly

with the solemn questions of spiritual and divine existence, and talked so vauntingly of their scientific demonstrations, will find that they have caught a Tartar. We cordially commend this work to our readers for earnest study."

It seems that the young editor has also unfortunately caught this same "Tartar," or more properly speaking, the Tartar has caught him on his little Microcosmic hook, and it makes him "sick." In his last fulmination it is observable that he neither speaks of "bait" nor counts his beads! We thought the last *Microcosm* would cure him. His vivid recollection of the last one he swallowed will prevent his ever saying "bait" again as long as he lives.

"OFF ON A TANGENT."

BY REV. PROF. SMITH B. GOODENOW.

WHY do we reckon from a *fixed* tangent? Simply because there is no other way to measure the *total* fall of a stone, or of a planet, but to reckon from a *fixed* starting point or line. My friend wants the tangent changed every second or half-second. He thinks the only way to describe how far his vessel has sailed from the latitude of New York, is to keep twisting round that line of latitude, till he gets it into a meridian of longitude to measure from!

There are *two ways* of describing the fall of a body, or any other distance traversed, (1) Item by item; i. e., giving the motion for each second, or hour, or day, *from the new starting place* of each, these items to be *added up* in reaching the total distance. (2) Aggregate reckoning; i. e., giving at each point reached the *total* distance passed over *from the first starting point*; as when we journey from the city A, to B 10 miles off, and on to C 20 miles off, and on to D 30 miles off. We have indeed traveled 10 miles in *each portion*, but we have as certainly traveled 30 miles *in all*. And here is an acute logician, who thinks, that because we can state the distance in the items, therefore we cannot state it in the aggregate.

Now both of these ways of stating the fall of a body (by *items* and by *amount*) apply alike and equally to a fall *straight downward* toward the centre under the influence of *gravity alone*, and to a fall *sidewise* under the influence of an *additional force*. And within any reasonable distance, say 1000 miles on the earth's surface, the *items* of travel from point to point, and the *total amount* of travel from the starting line of the race, are *alike in both cases*; namely, the items go as the odd numbers 1 plus 3 plus 5 plus 7, &c., in successive units of time, and the

aggregate goes as the sum of these odd numbers, or as the *square of the number* of items, 1 or 4 or 9 or 16, &c. This is clearly proved in Geometry, from the very nature and necessity of a curve and of motion on it,—as given in my demonstration sent May 10th. And yet this plainest mathematical truth, universally known from the very dawn of science, is now in this 19th century called in question!

Take the case of direct fall downwards. The distance which anybody will fall in the first second we call 1; then, the *new fall caused by gravity itself* in each second is 1, (which corresponds with the *equal fall of each second* from the *new tangent* of that second, in circular motion, as correctly given by the Editor). But the *acceleration*, or velocity brought over from previous seconds, adds an extra motion 2 to every successive second of direct fall; so that the *items* or parts of fall in successive seconds, are 1, then 1 plus 2, then 1 plus 2 plus 2, then 1 plus 2 plus 2 plus 2; i. e., 1 plus 3 plus 5 plus 7, &c.; totals: 1, 4, 9, 16, &c., as stated above. Now the *acceleration* 2 which is added into the direct fall of each new second, corresponds exactly to a 2 which is added into the *total* fall at each new second of the circular motion also,—being *the distance 2 of the new tangent of this second from the tangent of the previous second now left behind*. This 2 of tangential change plays precisely the same part in the falling or curvature of circular motion, as the 2 of acceleration plays in the increased momentum of a direct fall. Though not exactly *called* acceleration, it has the same value and effect on the distance fallen. Thus it is evident that curved motion corresponds exactly with motion directly downward, in respect to *total* amount of fall; and this cannot help being so, from the very laws of curvature known to all.

Let the reader do as the Editor suggests. Let him draw a curve, say of eight inches radius (large enough to make the measurements distinct), with a tangent line across its top. Then let him measure off on the curve, each way from its point of contact with the tangent four quarter-inch distances, the whole two inches corresponding to about 1000 miles on the earth's surface, or to 60,000 miles on the moon's orbit. Next let fall *exact* perpendiculars, from the tangent to each of these quarter-inch points; and measure *exactly* the lengths of these perpendiculars, to see what is the *total* fall from the tangent relatively, of these points, or of a body revolving by uniform intervals over them. The distances will be found as we have given them above, namely, as 1, 4, 9, 16; that is, *the same as if the body had fallen straight down* the radius from the starting tan-

gent. Is there any possible escape from this mathematical fact?

The only answer of the Editor to this decisive demonstration is, that this measurement of the successive intervals on the curve is *not exactly* correct. That is so: to be exact, the intervals should be measured as straight *chords* to the curve, not as parts of the curve itself. In other words, one foot of the dividers should remain *fixed* at the point of contact with the tangent, while the other foot marks off the distances, 1, 2, 3, 4, &c., on the curve.

This, the demonstration itself shows, as given in the article I sent. But this is an almost *incalculably small* variation, and of no practical account within the limits where alone this mode of measurement is used or belongs. Gravity operates constantly, i. e., infinitesimal intervals; and therefore, the truest application of the method is to *infinitesimal intervals* of time where the inexactness is entirely lost. We only apply it to larger intervals as seconds, for greater convenience in handling, the slight deviation not affecting the *rate* of fall thus found. A unit much smaller than a second might just as well (or better) be used; but even the travel of 100,000 seconds on the arc of the moon's orbit, does not give a final variation to the tangent fall thus measured (as compared with an exact reckoning by chord) of 1000th part of itself. Even at 90°, the variation is but 2 tenths. So that, in place of the enormous errors of this calculation, as set forth by the Editor, such that (he says) the gravity ratio of squared-distance-inverse will apply correctly only to the one interval of 1 *second*, which "happens" to hit this ratio,—in place of this, we find the law of the squared distance fallen, and *so* of the squared gravity ratio, applying *practically* without error for each and all of 100,000 or 1,000,000 seconds in succession, and therefore for the whole orbit.

The Editor says No! not for the whole orbit; because if we continue thus measuring from the *fixed* tangent till we get 90° from it, we shall have a considerable error, and worse still if we go all the way round. But I answer, there is no occasion or propriety in carrying the measurement thus far, or any farther than a few seconds, or infinitesimal intervals, where it is correct,—just enough to learn the *nature of the curvature*, and its rate of fall in successive intervals, which is all this geometric measurement is used for. When we have learned the pace of our animal, we do not need, in seeing that it is kept up, to go away back for reckoning (as at first) to the start of the journey, but can just as properly reckon anew from some new town we afterwards pass. We measure off a ten acre lot with a rod pole,

so many lengths each way, thinking we thus have "a level thing" and we are accurate enough in this for all practical purposes, though we have taken no account of the curvature of the earth, which, if we continue on measuring that way (without allowance) for a thousand inches, would give us a very un-level thing. Because sections and townships, and ranges, cannot be laid out by the United States government, without "correction" lines for change in the length of longitude degrees, therefore my friend thinks it will not do for me to lay out my front-yard with a "fixed" chain (or tangent) for fear of my running across his new-framed theory!

The fact is, we measure the *direct* fall of a body from a point on the starting tangent: and we *must* measure the *orbital* or side-fall from the same starting tangent, in order to compare the two cases at all. The Editor measures the direct fall correctly from its first starting point on the tangent, as giving distances 1 plus 3 plus 5 plus 7; total fall at successive intervals 1, 4, 9, 16; and he insists very much on including the *acceleration* 2 at each term, never resting satisfied with the uniform 1 of each term which expresses the *new action of gravity simply* in that term. But the moment he comes to curvilinear or orbital fall, *to compare it with the former*, he changes his tactics at once, and insists that we must not reckon from the first starting tangent by which we would, unhappily for him, get the same values as before, but must *leave out* the 2 of tangential change at each term corresponding to acceleration, and must acknowledge only, as the *whole* fall, that uniform 1, which is the new gravity effect in each term! and this is the proposed improvement of science.

The grand answer to all cavil is this: The Second Law of Motion, on composition of Forces (which some seem not to understand,) *compels* gravity to pull down a body moving sidewise just as much as if left to direct fall. And we have a mode of measurement which reveals or confirms the fact, as seen above. Any *imperfection of the measurement* (if carried on too far) does *not affect the value itself*, which follows invariable law. A straight measure (by line or by dividers) applied to a *very small arc*, may determine the size of the whole circle: yet if long straight measures were applied *all round*, the *measurement* would become very imperfect, though the real circle value would remain unaffected.

From the above we see how inaccurate is the teaching of the Microcosm for March, p. 4, "fourth law of motion" concerning projectiles: and how correct are our text-books, in making them fall *from the tangent* just as fast as if let fall perpendicularly.

This one point settled is enough now. The other branch of the subject must wait till next time.

ANSWER TO PROF. GOODENOW.

WE have in the foregoing argument, without a doubt, the very strongest thing that can be said in favor of Newton's great demonstration in which the fall of the moon from a fixed tangent is the chief factor. Prof. Goodenow comes forward boldly to the defense of such tangent, well knowing if it cannot be sustained and shown to be scientific and rational, that Newton's law must break down hopelessly. We are glad that the controversy has been thus narrowed down, to a single central proposition, as we will now undertake to show, so plainly that a beginner in natural philosophy cannot fail to see it, that Prof. Goodenow himself has not only conceded all we contend for, but that he has broken Newton's "yard-stick" by overthrowing and destroying his so-called demonstration. To this end we ask the reader carefully to examine the foregoing article, if he has not already done so, before entering upon this rejoinder.

The professor asks: "Why do we reckon from a fixed tangent?" A most important inquiry. His answer is, to get a "starting point." But who ever heard of the starting point to a *ring* or a perfect *circle*? There is a plain "starting point" to a stone's fall, for it *starts* from a state of rest, and *begins* to move and goes on faster and faster with a regular and mathematical acceleration. But the moon does not start at all: hence it has no "starting-point," but moves in a *circle* without any acceleration in its motion or anything in the slightest degree analogous to the start and increasing continuance of a stone's fall from a state of rest. As well make an arbitrary chalk-mark on a hoop and then compare this mark to the end of a straight yard-stick! Hence to talk about a starting point on the circle followed by the moon at a uniform velocity is to talk nonsense, since you are obliged arbitrarily to mark this "starting point," as at *e* in our diagram, and if that point loses all meaning and leads to false results in a few seconds, as we see it does, and as Prof. Goodenow admits (soon to be shown), it is manifest that so far from a demonstration of anything it degenerates into a school-boyish invention unworthy of a great mind, and an insult to the memory of Euclid. That the departure of the moon vertically from the fixed tangent at a rate corresponding for a brief period to a stone's continuous acceleration is a mere coincidence, without any scientific signi-

ficance or natural relationship between such departure and the fall of a stone, will be apparent by examining our article with diagram on another page. We have just as much arbitrary right to estimate a falling stone's acceleration by reckoning from the sides of an imaginary circle surrounding such fall, and then call it a "demonstration," as had Newton to draw an imaginary tangent from the outside of the circular path of the moon, and then pretend to calculate the force of gravity exerted upon the moon by measuring its rate of departure from said line. Suppose the stone to start falling on the perpendicular line toward *s*, beginning at *c*; no one can dispute but that there is a kind of acceleration in its gradual departure from the different points on the circle, *e*, *m*, *n*, *o*, *r*, &c.! Why not then, frame a formula and call this measurement a demonstration, on the arbitrary plan of Newton, and thus show that the acceleration of the stone's fall has been wrongly estimated heretofore? 'Tis true this accelerated departure of the stone from the circle is irregular, only holding good at one particular part of the curve, and that for only a second or so, and then gets wrong, becoming worse and worse till it gets to *v*, where it goes all to pieces by changing from acceleration to retardation! But what of that? Such a trifle does not interfere with Newton's important demonstration so long as it only matches for a second or so in 27 days! We can draw a new circle every second, if necessary, to make it fit the formula, just as easily as Newton can strike a new tangent every time the old yard-stick breaks down! Why not? Then this improved method of estimating the stone's accelerated *straight fall* by calculating from a *circle* ought to be right since it is only the exact converse of Newton's method which estimates the moon's *uniform curvilinear fall* by measuring from a *straight line*! We surely have just as much right to invent the imaginary circle *B*, drawn around the stone's path and then change it every second to suit the stone's actual fall as Newton had to invent the fixed tangent and then change it as often as the moon's fall required it! We trust the professor sees the point.

But enough of this by-play. Let us now come down to serious work. We have not room to notice all his wordy points such as his illustrations concerning a vessel sailing from New York, measuring off a piece of ground, traveling to different cities 10 miles apart, and the accelerating horse whose pace we suppose was to correspond to that of a falling stone or something else, &c. If the professor really knows what he means by these various illustrations, or what bearing they have on the utility or

scientific meaning of a fixed tangent for the moon, he can beat *The Microcosm*. But he does say something that we understand, or at least think we do. He asserts, with the most commendable caution that Newton's method of measuring the moon's fall from its tangent will hold good for "100,000 or 1,000,000 seconds in succession, and therefore for the whole orbit." Of course he means, if a "new tangent" be struck from the orbit every new second. We do not deny this. We admit that the coincidence will hold good if tangents enough be drawn, and at the right times! But what a ridiculous fallacy that fastens upon a coincidence which holds good for a second or so, and then breaks all to pieces! What science, reason, or philosophy authorizes this taking up of a new "yard-stick" every second, or as fast as the old yard-stick breaks? Is this geometry, or is it the wind-broken nag whose "pace" the professor tries to introduce. But note the important fact. He admits that the new tangent must be drawn at short intervals, and also acknowledges the correctness of our charge of "a considerable error," as he mildly puts it, before it reaches the first quarter or 90°, "and worse still if we go all the way around." But what is his answer? Does he dispute our charge of "error?" Not at all, since that is indisputable. These are his words:—

"But I answer, there is no occasion or propriety in carrying the measurement thus far, or any farther than a few seconds or infinitesimal intervals where it is correct,—just enough to learn the nature of the curvature and its rate of fall in successive intervals, which is all that this geometric measurement is used for!"

This is a very frank confession and as fatal as it is frank. The geometric formula is only intended for just that small part of the curve where it happens to fit, and then the boasted formula requires us to strike a "new tangent," which will of course fit the next equal period of the moon's travel, because it is the same coincidence right over and over every time a new tangent is drawn, since the moon's travel is at a uniform rate of speed! But how can this "geometric measurement" be "just enough to learn the nature of the curvature," when it only applies to a small fraction of the "curvature,"—"a few seconds" of the moon's travel,—and then immediately gets all out of joint? It certainly cannot teach the "nature of the curvature at all, unless it holds good for the entire curvature" from *c* to *v*. As well try to estimate the speed of the professor's "animal," at the end of a five mile run, by witnessing its "pace" during the first "few seconds!" Prof. Goodenow claims that he can correctly tell just how the race must terminate by witnessing the "pace of our animal" at the very start, even

though he has seen the same animal break down previously in going half a mile!

But this is not the more fatal part of the professor's admissions. He says there is "no propriety" in retaining the fixed tangent longer than "a few seconds"! Mark the language carefully. Hence it must be *improper* and *unscientific* to retain it more than "a few seconds," and thus he unwittingly concedes our entire argument, as illustrated by the diagram on another page, that it is erroneous to attempt to apply this formula to more than a very small fraction of this curve where it leaves the tangent and where the coincidence happens to occur! We little dreamt, when we presented our argument last month against the fixed tangent in reply to the *Christian Standard*, that it would thus soon compel such a surrender on the part of a great mathematician and astronomer! But how could he help it if he made the measurements as we suggested in that article?

But this is only a partial surrender of the fort. We are happy to announce that the surrender is complete and unconditional. First he turns his guns upon himself by a flat self-contradiction. He says there is "no propriety" in applying this "geometric measurement" to the fixed tangent for more than "a few seconds," and then declares in another place that it will come out perfectly correct if "four quarter-inch distances" be measured off on a "curve, say of eight inches radius"! Yet it actually takes the moon more than three hours to pass over those "four quarter-inch distances" on a circle of that size! Thus, according to Prof. Goodenow, it is *right* to employ this "geometric measurement" three hours, but it is *wrong* to employ it more than a "few seconds" because there is "no propriety" in it!

This is what he no doubt calls in a former article, Newton's "pure mathematics" by which this "yard-stick" was originally constructed and employed.

But here comes the surrender in a still stronger shape. He says "it is correct" for the tangent to be changed at "*infinitesimal intervals*;" in other words, "it is correct" for a new tangent to be drawn at *every instant of time*, which is exactly what we said in last month's *Microcosm*, the first time it was ever said, namely, that the only correct tangent is one that keeps pace with the moon's uniform motion, without remaining fixed for even the thousandth part of a second! It is thus a matter of record that Prof. Goodenow admits us to be "correct" in this change of tangent at "*infinitesimal intervals*." Now let him prove that he and Newton are "correct" in continuing

this tangent for "a few seconds," or that there is any natural relation between the moon's fall from such fixed tangent and the accelerated fall of a stone here.

It is thus seen that we need only let this great mathematician argue his points fully and he will explode his own positions and sustain ours. As a universal rule, give a false theory of science rope enough and it will hang itself every time.

But the foregoing are tame efforts at self-destruction compared to the following. We have now the pleasure, with Professor Goodenow's assistance, of presenting an argument against Newton's entire law and demonstration which we have reserved for this final reply whenever the opportunity should offer, though we have barely hinted at it in a former article. It will be recollected that Prof. Goodenow declared, as published in the February *Microcosm*, that if Newton could be shown to be wrong in these demonstrations, it would be "*the most stupendous overturn in science that the world has ever seen.*" We have now come to this "stupendous overthrow in science," and have waited patiently for the necessary admissions which we now have from the professor's pen and which make our opportunity complete. Here is the culminating argument:

The assumption underlying Newton's demonstration is, that the fall of a stone 16 feet in a second is caused by gravity alone. It is then assumed that the fall of the moon from its tangent in the same second, is also caused by gravity alone; and this fall of the moon being the one 3,600th part of 16 feet, hence the "demonstration" that gravity decreases from here to the moon 3,600-fold, or as the square of the earth's radius. Prof. Goodenow, in the foregoing article admits that we thus state it correctly. Here are his words:—

"Take the case of the direct fall downwards. The distance which any body will fall in the first second we call 1; then the new fall caused by gravity itself in each second is 1, which corresponds with the equal fall of each second from the new tangent of that second in circular motion as correctly given by the Editor!"

Thus we have it that the stone's fall 16 feet in the first second, as well as 16 feet in each second thereafter, is 1, and hence must be the work of "gravity itself." If it is not, then the fall of the moon during one second which is confessedly the work of gravity alone, is utterly without meaning in comparing the two falls! But here the whole comparison, as well as the demonstration of Newton breaks down, for it is plain that not the one 10,000th part of the 16 feet of the stone's fall is really the work of "gravity itself," but is the result of *accumulated motion*, with which gravity has nothing

to do, as a tyro in arithmetic can show in two minutes. By figuring backward from the fall of a full second 16 feet, we find that the stone actually falls only *one foot* in the first *quarter of a second*, or at the rate of only *four feet* in a second instead of 16! If we figure back to the first 16th of a second from the commencement, we find that the stone falls but *three-quarters of an inch* in that period, or at the rate only of *three inches in a second* instead of 16 feet! And if we figure back to a fraction of time short enough, as we have taken the trouble to do, we will find that at the start of the stone's fall it does not travel at the rate of more than the 64th of an inch in a second! Thus we prove beyond cavil or doubt, that of the 16 feet fall in a second, as being the work of *gravity alone*, upon which Newton's entire demonstration is based, only the one 64th of an inch is really the work of gravity, the rest being the result of *accumulated velocity* in which gravity takes no part whatever! How can any rational mind doubt this, since "gravity itself" can only act throughout the entire second *uniformly, or the same as it acts at the very start?* This must also be true during every subsequent second. It is simply astonishing that a mathematician should take the acquired velocity of a falling stone through a whole second and call this "1," or the work of "gravity itself" when the most superficial thought would have convinced him that more than 15 feet 11 inches of the 16 feet fall were not the work of gravity at all! Why did he not take a whole *minute* as "1" and call this the work of "gravity itself"? There is no greater absurdity in taking a full minute, in which the accumulated velocity surpasses the speed of a rifle bullet, than there was in the weak fallacy of Sir Isaac Newton in selecting a full second and then superficially supposing, like a mere child, that the 16 feet thus accumulated was the work of gravity alone! Yet this self-evident error has been regarded by all astronomers since the time of Newton as one of the principal achievements of this greatest of all scientists! And because we have dared to point out and expose such an astounding blunder, the petulant "scientist" of the *Standard* calls it "infamous!" We rather like such *infamy*, and thank the *Standard* for its calumny!

We thus see that the true analysis of the stone's fall utterly shatters Newton's "yardstick," and pulverizes his demonstration to dust, since the fall of the moon is confessedly the work of gravity alone, *its motion being absolutely uniform, and without any assistance from accumulated velocity?* And by this argument also, is Prof. Goodnow's last desperate

effort to sustain Newton brought to grief. (Will he now frankly admit the "most stupendous overturn in science the world has ever seen"?) Had the professor consented to remain quiet and not press his present communication, which we insert with our answer at the expense of crowding out of *The Microcosm* much other important matter, he would have saved himself and Newton from this final and overwhelming disaster. He has sown to the tornado. He must be content to reap the *cyclone*.

A NEW DISCOVERY.

JUST as we go to press Prof. Goodnow sends us a new discovery of his own by which to enforce Newton's general law. It is very ingenious and will appear in the August *Microcosm* with a novel and startling diagram that will be a genuine treat to our scientific readers. This new departure is a tacit admission that Newton, if not absolutely wrong, is wretchedly defective in his mode of estimating the moon's fall from a fixed tangent. We confess that we begin to have strong hopes of the Professor, when he thus shows the independence to strike out on his own hook, as it were, to correct Newton's oversights. We do not expect to be alone in our departures from established science, but anticipate any amount of company before the next volume closes.

THE ELECTRICAL THEORY OF ASTRONOMY.

SOME of our readers may not be aware that there is a theory coming into vogue which teaches that all the motions of the heavenly bodies, such as the earth's revolutions on its axis and around the Sun, are caused by electrical or magnetic attraction and repulsion, and that Newton's Universal Law of gravitation utterly fails to give a rational explanation of these phenomena. The oldest and ablest advocate of this new theory is the Rev. B. T. Kavanaugh, D.D., of Owingsville, Ky., who will explain and argue the new doctrine in a series of short articles, beginning in the first number of Vol. 2 of this paper. Our readers may look for something new and interesting in science.

A STRONG INDORSEMENT.

WE give space to the following concisely written letter indorsing the corpuscular hypothesis of sound, from the pen of Prof. Goree, as published in the *Alabama University Monthly*. Prof. Goree has the happy faculty

of expressing himself so as to be easily understood :—

A NEW THEORY OF SOUND.

In undertaking to write a short article for the *University Monthly*, on the new theory of sound, I do not put myself forward as a champion of the theory. My sole object is, to direct the attention of the readers of the *Monthly* to the remarkable book in which the theory is advanced, and with wondrous ability supported. I should have not undertaken even that modest task, but for the reason that a large portion of the press of the country are singularly silent about what, in the opinion of very many persons—professors of physical science in colleges, and others well qualified to judge—is destined to effect an immense change—a revolution, in fact—in our entire system of natural philosophy.

The book to which I wish to direct attention is entitled *The Problem of Human Life, Here and Hereafter*. The author is A. Wilford Hall, of the firm of Hall & Co., 130 E. Eighth street, New York. The principal object of the book is to disprove the theory of Evolution. Without pretending to an opinion as to the conclusiveness of the arguments against Evolution, or Darwinism, I wish simply to note that Hall's discussion of the matter is thoroughly original, and, as confessed by tens of thousands of sensible persons, is altogether the most forcible arraignment that has ever been made of that very popular theory. He is especially happy in showing how exceedingly inconsistent is every prominent advocate of Evolution, not only with the others, but with himself.

A considerable part of the book is devoted to a discussion of Sound. Of the complete success of this portion of the work I do not hesitate to affirm positively. His discussion is so plain, so searching, so comprehensive, that no doubt can be entertained by the impartial reader of its being an absolute demonstration, at the end of which ought to be written, as at the close of a theorem in Geometry, Q. E. D.

With a view of exciting in your readers such an interest in the book as will induce them to get it and judge for themselves, I will glance at some of his arguments against the popular or air-wave theory of sound. Writing from memory, not having the book at hand, my enumeration of points must be very limited.

Professors Helmholtz and Tyndall assume, in discussing the phenomena of sound, that the prongs of an ordinary tuning-fork travel at immense speed. Hall affirms that their speed is slow, not exceeding seven inches per second in one direction ; or, estimating their travel both ways, to and fro, not exceeding fourteen

inches per second. How, asks Hall, can the prong or a tuning-fork which travels only seven inches per second, originate air-waves that travel at the rate of say eleven hundred feet per second?

One of Hall's most forcible arguments is his discussion of the sound made by a certain species of locust, which makes itself heard nearly two miles away, or over a space of four cubic miles. It must be remembered here that the popular explanation of the phenomena of sound is compelled to indicate the length of the air-wave roused by any noise-producing object, some of these waves, like those corresponding to the lower notes of the organ, being several feet in length, from crest to crest. The phenomena of sound, our scientists tell us, are due to the impact of these air-waves against the tympanic membrane, causing it to vibrate—that is, bend in and out—several hundred or several thousand times per second, according as the note is high or low. Hall, by supposing that tympanic membranes were arranged, at small intervals, all over a space of four cubic miles, demonstrates that it would require the united force of all the locomotives in the United States to rouse sufficient air-waves to move all those tympanic membranes to the vibration, or bending in and out required by the popular theory of sound, to say nothing of the fact that they must be so bent at least several hundred times each second. Hall had a right to assume that so many membranes were in the four cubic miles, for no one can doubt that an ear placed at any point would hear the locust's sound. Yet according to the popular mechanical theory of sound-waves, all these wondrous stirrings of the air, through four cubic miles, are accomplished by an insect, not one inch long, and by an unlaborious exercise of the minute muscles of its tiny legs. For not only must the air of this entire area be stirred to waves of measurable length, but these waves must have such force of compression as to augment the temperature of the air, at each wave's apex or condensation point, one-sixth, to meet the requirements of the theory.

Hall, in another place, discusses the passage of sound through liquid and solid bodies. How, he asks, can sound, if it be due to air-waves, pass more readily through water and the metals than through air?

Everybody knows that there is a certain amount of air in most water, but everybody must also know, by a moment's thought, that there is not enough air in water, for the purpose of the air-wave theory of sound. This difficulty is if possible, still greater in reference to the passage of sound through the

metals, silver, gold, platinum, and iron. In such substances there are not supplies of air to form the air-waves needful to the popular theory of sound; and yet, through all of them sound passes with immensely more facility than through air.

Hall closes his long discussion of the phenomena of sound with an argument which, if taken by itself, is proof positive of the fallacy of the popular theory. This argument, and scores of others, I omit for fear of occupying more space than is agreeable to the editors of the *Monthly*. Let me assure your readers that, on every point, the discussion is exceedingly interesting. On taking up the book, I could with difficulty lay it down, but read it night and day until the end was reached.

I believe I ought not to close without giving some facts that show how rapidly Hall's views are being circulated and accepted. His *Problem of Human Life*, is now in its thirtieth edition, and his little monthly, *The Literary Microcosm*, has in nine months attained a circulation of fifty thousand copies. Subscriptions to his paper are coming in at the rate of 1,800 to 2,000 per month, and for several months past one-half of these new subscribers have been clergymen of the various denominations—Episcopal, Roman Catholic, Presbyterian, Methodist, Lutheran, Baptist, Congregational, Disciples, Moravian, etc., etc.

I ought not to fail to point out the revolutionary nature of his teachings, as indicated by himself. The wave-theory of light will follow—the latter theory having been suggested by the former. Along with them will go heat, electricity, etc., as modes of motion. In truth, as I before said, if Hall be right, he will compel a reconstruction of our whole system of Natural Philosophy. Nor is this all. Every one who knows much of popular scientific speculations, knows that, unsatisfied with making sound, light, heat, etc., mere phenomena of motion, without objective subsistence, many of the most prominent scientists, if not by actual avowal, by the drift of all that they have taught, were extending their phenomenal theories to life and mind, making these only phenomena of the play of the organic atoms or molecules. Hall's argument, setting out with the incontrovertible demonstration that both sound and light, like odor, are real substances, is readily extended to electricity, magnetism, life and mind. He thus does away with the whole "phenomenal" basis of the arguments of atheists and unbelievers.

Most persons who read the book become not only converts to his teachings, but enthusiastic in advocating them. The preachers, especially, of all denominations, affirm that, while

for years they have cowered before the Evolutionists, they are not now afraid, with Hall's book in hand, to meet in debate their most distinguished representatives.

Before concluding, I take occasion to repeat, that I must not be regarded as a champion of the new theories put forth in the "Problem." Neither my health nor capacities justify such a role. My object is simply to call attention to this very remarkable book. I have presented some of the simplest arguments, lest your readers might be led to pooh! pooh! the whole discussion as a probable mass of assumptions and absurdities. I warn any of your readers who may prefer popular errors to unpopular truths, to avoid the book. If they read it, the chances are as ninety-nine to one that they will become converts to the new doctrines.

Finally, I will say, that though I do not feel competent to discuss such matters, if the editors of the *Monthly* can find a champion of the popular theory of sound, I will engage to find a champion of Hall's theory—each being allowed equal space in the columns of your paper. This would give the editors of the *Monthly* an excellent opportunity to compare the two theories. And that the disputants might not take up too much space, let the length of the articles be prescribed beforehand—say four or six pages of your *Monthly*.

Individually, Messrs. Editors, I am convinced that Hall's book will inaugurate a new era in orthodox Christianity. I never think of the grand book without wishing to exclaim:

"Triumphant Zion, lift your head
From dust and darkness and the dead;
Though humbled long, awake at length,
And robe thee in thy Saviour's strength."

J. A. GOREE.

“SCIENCE AND HEALTH.”

THERE is a monthly journal by the above title published at Lewisburg, Pa., connected, we believe, with the college there and which, of course, makes a good deal of pretention to scientific and educational lore. The editor actually pretends to review the *Problem of Human Life*, and in doing so condemns the book because he thinks its aim is to "strengthen" the "weak points" in the theories or the men it reviews! These are the culminating words of that sage critic:

"We have spent a good many hours over this work, and it seems to us if present accepted theories have *weak points*, Wilford Hall has not taken the *correct method to strengthen them!*"

If this writer will consult one of the boys in the preparatory class of Natural Philosophy in that college, he will find out that the "Problem" was not trying to "strengthen" the

"weak points" in the arguments of Darwin, Tyndall, Helmholtz & Co., but to *expose* them, and thus explode their theories. But it is a pity that even a boy should waste time from his studies trying to beat sense into the head of a writer who could so egregiously misapprehend the very spirit of a book after having "spent a good many hours" over it. We suggest that he make application to Mr. Bowen for the position of associate editor of the *Independent*.

PROF. CARTER AND PROF. GOREE.

It would be well for those editors who without reading it, so flippantly condemn the *Problem of Human Life*, to read the two articles in this paper from the above-named professors, one copied from the organ of a great University, and the other from the pen of a professor of physics and higher mathematics in a first-class educational institution in Pa. If they will take this trouble they will quit comparing "Wilford Hall's acoustics" to "John Jasper's astronomy."

MICROCOSMIC DEBRIS.

HARVARD COLLEGE proper has been living beyond its income for four years to the average amount of \$12,500 a year. The deficit for 1880-81, amounting to \$34,469.19, is the largest the college has ever incurred.

The house in London in which Milton wrote the greater part of "Paradise Lost," 19 York street, Westminster, has been almost wholly pulled down, but the front door and its adjacent parts are still left to serve the purpose of a boarding.

According to the *Bombay Gazette*, the total number of cases of cholera during the past year was 30,966, of which 14,282 proved fatal. The latest returns show that for the present, at least, the disease has wholly disappeared in that part of the world.

An Omaha girl, intent on suicide, tied one end of a long rope to her waist and the other to the bridge from which she dropped into the river. Her idea was to prevent her body from being lost; but the rope served the more valuable purpose of saving her life, as a man hauled her up by it.

As compared with the population there are more marriages in France than in England. The percentage is given at 88 for the former, and 86 for the latter. In France, however, the birth rate continues to decrease, which is regarded by French economists as a very ominous fact.

Queen Sophie, of Naples, the heroine of Gnetta, is as accomplished a horsewoman as her sister, the Empress of Austria. She passed all last winter at Paris, breaking horses and ponies at the Hippodrome, which was closed against the public for the season.

The work of widening the famous Magdalen Bridge, at Oxford, England, is already in progress. The extent of the enlargement will be about twenty feet on what is known as the Botanical Garden side, so that the side facing southwest, in which lies the chief beauty of the structure, will remain uninjured.

An act is about to be introduced into the French Chambers which may have the effect of keeping alive a great many children who would otherwise die. It gives the municipal authorities the power, which they have never yet had, to deal stringently with parents who neglect their offspring morally and physically.

The new die for the next issue of golden coinage from the British Mint is now completed and in the possession of the authorities at the mint. This is only the second die taken during the reign of Queen Victoria, who is represented with an imperial crown, and the likeness is that of the Queen of the present year.

An eagle, whose wings measured seven feet from tip to tip, attempted to steal a goose on a farm in Jutland, Denmark, not long ago. The cries of the goose awoke farmer Jensen, who caught the eagle, and, with the aid of his servant girl, cut its throat before it could extricate its talons from the goose's back.

Parisians are growing nervous about hydrophobia. As stated in the *Bulletin de l'Academie*, there were twenty-three cases of the disease in 1881, the largest known since 1878, when there were twenty-four. The cause is stated by the *Conseil d'Hygiene* to be a growing laxity in carrying out the provisions of the 'dog law,' which in Paris are very strict.

Grass is said to grow luxuriantly in Waldeck's capital, Arolsen. There are no railroads within the principality, and the post chaises are of the style of fifty years ago. There was quite an interesting scene on the morning when the Duchess of Albany left her childhood's home. The royal family are very much beloved, and the whole town turned out to bid good-bye to their pet, Princess Helen.

According to the *New Remedies* a root is found in the mountainous regions of California, Oregon, Utah and Montana, which, if all that is stated of it is true, bids fair to become somewhat of a rival to quinine. The miners, who call it "Oregon Grape Root" (*Berberis Aquifolium*), use it in the form of a

decoction for "mountain fever." It is reported by them to be effective in this form of malaria, and to break up its recurrences.

The large estates in the province of Posen are passing from the hands of their Polish owners into those of Germans. Last year twenty-nine estates, with 89,590 acres of land had thus changed hands, and many large estates are now in the market. The Polish press lifts its warning voice in vain against these transfers of property.

At her first appearance since the death of her husband on the stage of Albert Hall, London, Mme. Nilsson was dressed in deepest mourning, and her first notes betrayed her agitation by a tremulous quiver. But she soon conquered herself, and her full, strong voice rang through the hall with all its old-timed sweetness. The audience applauded rapturously, but she firmly declined the encore.

Two convicts in the California State prison took delight in torturing a timid fellow, whose cell was between their own, by pretending at night that they saw ghosts. They talked to each other about it, describing the most awful sights, and counterfeiting excessive fright. A week or two of this treatment drove the victim crazy, and he imagined that he was haunted by the creatures which he conjured up.

The captain of a vessel bound from the Mauritius to Tasmania, last November, attributes her riding out a terrific storm entirely to oil. Saturated swabs, with weights attached to keep them in position, were cast over every two hours, and mountainous waves meeting the oil glided off, leaving merely a heavy swell. The calming effect of oil is thoroughly established. Hence the remark: "Throw oil on the troubled waters."

A great calamity has fallen on the seafaring population of Brittany, in France. At all the ancient fishing towns south of Brest the inhabitants have for years obtained their livelihood from the sardine fishery. Suddenly, without any warning, this industry is in danger of destruction. The men go out in their boats as usual, but they return without any fish having been caught in their nets. The sardines have deserted the shores of Brittany for other scenes, and with their absence nothing but poverty is in store in the future for the hardest working section of the French population.

Gen. Gordon, who has made a great deal of money out of railroads since he resigned his seat in the United States Senate, is going to Europe on business connected with development of land in Southern States.

Bands of music are forbidden to play on most

of the large iron bridges of the world. This is due to the well-known phenomenon that a constant succession of sound-waves, especially such as come from the playing of a good band, will excite the wire vibrations. At first these vibrations are very slight, but they increase as the sound-waves continue to come.

[This ridiculous absurdity still goes the rounds of the press, just as if the long wires of a bridge would respond sympathetically to musical tones! The reason bands are not allowed to play in crossing bridges is that the people will keep step to the music, which works up the dangerous swing to the structure. Soldiers are required to break ranks in crossing bridges for the same reason.—*Editor Microcosm.*]

A paper laid before the Biological Society of Paris tells us, from a scientific point of view, what it is to be "dead drunk." It seems that this condition exists when the vital fluid presents the proportion of 1 of alcohol to 195 of blood. It is at this stage that most drunkards cease drinking, or we would have more deaths from alcoholism; for when the inebriate continues to drink until each 100 parts of blood contains 1 part of alcohol, death invariably ensues.

It is estimated that England alone consumes 1,200,000 pounds of ivory every year. This entails the death of 30,000 elephants, and it is thought that not fewer than 100,000 die annually. They breed slowly in the jungle and not at all when in confinement, even in their own country. The recent cases of birth here are extraordinary exceptions to an established rule. The London *Spectator* contemplates that Jumbo, if he attain full age—some 150 years—may be the last of his species; but it remains to be seen whether, as the births in "Zoos" have begun, the animals may not increase and multiply.

Not long ago a Paris lady who has a mania for collecting postage stamps, and who owns a marvellous album, tried and tried in vain to get a complete series of Bulgarian stamps. She made all kinds of offers, sent out commissions, &c., and at last, impatient at all the delay, determined to make a bold effort to get what she wanted or perish in the attempt. She wrote a letter to Prince Alexander, of Bulgaria, explaining matters to him, and asking him to come to her assistance. Presently came a graceful letter written in the Prince's own hand, and enclosing a complete collection of his country's stamps.

The Government method prescribed for cleansing brass, and in use at all the United States arsenals, is claimed to be the best in the world. The plan is to make a mixture of one

part common nitric acid and one-half part sulphuric acid in a stone jar, having also ready a pail of fresh water and a box of sawdust. The articles to be treated are dipped into the acid, then removed into the water, and finally rubbed with sawdust. This immediately changes them to a brilliant color. If the brass has become greasy, it is first dipped in a strong solution of potash and soda, then in warm water; this cuts the grease, so that the acid has free power to act.

When Sir Charles Lyell, the eminent geologist, was in America, he seems to have had some curious advice given to him about travelling on the Mississippi steamboats. "Never pay your fare until you are compelled to," was the first piece of wisdom thrown at him. "And, pray, why not?" he asked. "Because your chances are better in case of trouble." "How is this?" asked Lyell. "Well," answered the American, "when I was travelling up the river last March, somebody cried out, 'Passenger overboard!' The Captain hurried to the office and asked, 'Has the man overboard paid his fare!' On being answered in the affirmative, he turned to the pilot and said indifferently, 'Go ahead, it's all right!'"

A touching scene is reported as having taken place in the death chamber of the Italian statesman, Lanza, who died the other day. King Humbert had been admitted to pay him a last visit, and stood by his bedside some minutes, sorrowfully contemplating the pallid face of his old friend, who was plunged in a sort of lethargy, and appeared quite unconscious. Presently the King took the dying man's hand in his, pressed it gently, and exclaimed: "Lanza, do you know me? I am Humbert—Victor Emanuel's son." Lanza feebly opened his eyes, cast an affectionate look at the monarch, faintly ejaculated the words, "Mio Re!"

(My King!) and relapsed into insensibility. A few minutes later he breathed his last.

New Zealand papers state that among the recent European visitors to the colony was the Rev. Mr. Green, a member of the Alpine Club, who with two guides, attempted the ascent of the glaciers of Mount Cook, 13,000 feet high to the summit. Mr. Green says that after fourteen hours' labor they managed to cross the moraine of the Tasman glacier and reach the ice. None of them had ever seen such a moraine before. The Swiss guides assert that there is more moraine matter on the Tasman glacier than on all the Swiss glaciers put together, and they say that one of the finest Alpine scenes they have witnessed is half way up the glacier; in fact, nothing in Switzerland can compare with it. They consider the mountain the most difficult one they have ever ascended.

In two, if not more, of the provinces of France the cry of "The wolf!" is again being raised by the peasantry. Amid the hills of Ceyennes and the chestnut forests of the south of Limousin the wolves have of late years been increasing in numbers, and have ventured upon attacking the cultivators of the soil. The louvetier, whose duty it is to stop the ravages of these animals, knows very well that were they exterminated his office and his pleasure would both be gone; and if he moves at all it is generally to march into the woods in the company of a motley crew whose shots are usually more dangerous to themselves than to the wolves. Hitherto the price of a wolf's head has been considerably less than \$5, and there has not been any inducement for a practical shot to enter upon the pursuit. The peasantry now demand that the reward for the destruction of each animal shall be raised at least twelfefold.